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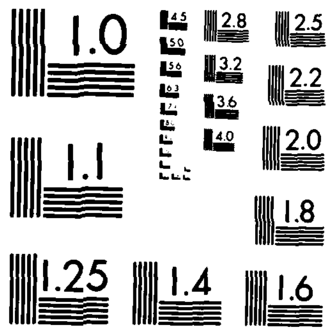
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Monterey, California

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BETWEEN SCYLLA AND CHARYBDIS:
THEATER NUCLEAR FORCES IN EUROPE

by

Carl William Dossel

March 1985

Thesis Advisor: R.H.S. Stolfi

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Between Scylla and Charybdis:
Theater Nuclear Forces in Europe

by

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Lieutenant, United States Navy
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Submitted in partial fulfillment of the
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Briefly, it concludes that NATO's approach to nuclear force structure and doctrine might be charitably labled *ad hoc*. In view of present and projected Warsaw Pact conventional and nuclear capabilities, the credibility of flexible response suffers accordingly. To remedy this situation, a series of recommendations are made, the gist of which are: adoption of a mobile conventional defense; removal of battlefield nuclear weapons from Europe, and the enhancement of the survivability of theater-strategic systems while seeking the ultimate elimination of theater nuclear weapons on both sides through arms control talks.

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Lisbon Conference decision[1] would lead the country into social and economic chaos. Our European allies were in the midst of rebuilding their economic base, destroyed in the last war, and would be even more susceptible to this problem. Nuclear weapons, particularly the smaller, "tactical" weapons, became an attractive alternative to conventional defense schemes. The central role of nuclear weapons in U.S. strategy was enshrined in the doctrine of "massive retaliation"--the declared use of a broad range of retaliatory measures to counter Communist inspired aggression anywhere in the world, up to and including the use of strategic nuclear forces.

In June 1955 Operation "Carte Blanche" took place. For the first time, an exercise was held with the employment of (simulated) tactical nuclear weapons. The scenario involved turning back a WTO armored assault across the Central Front. Some 335 air-dropped weapons were employed in a corridor running from Hamburg to Munich (although the exercise itself spread into portions of France and the Low Countries--a total of nearly 13.4 megatons. The collateral effects (judged later by neutral observers) were staggering. German civilian casualties were estimated to be over 1.7 million dead and another 3.5 million calculated, nor were military casualties (friendly forces)

---

[1] Member nations of NATO agreed at the 1952 Lisbon Conference that 96 divisions would be sufficient to meet the 175 smaller divisions the Soviets could be expected to muster.

KT) and the Mk. 7 [Photo 3] (1,500 lb. and able to be carried by smaller fighter bombers) both entered the stockpile in 1952 [Ref. 4].

B. 1952-1960: THE RISE OF TACTICAL NUCLEAR WEAPONS

When Dwight Eisenhower entered the Presidency in January 1953, he brought with him a certain experience and knowledge about nuclear weapons that his predecessor lacked. While Eisenhower was serving as the first NATO Supreme Allied Commander (1950-52), the JCS authorized him in January 1952 to begin using atomic bombs in NATO war planning. One month later, the final report of Project VISTA, a study conducted by J. Robert Oppenheimer and the California Institute of Technology, concluded that employment of tactical nuclear weapons held "outstanding promise" in the defense of Western Europe [Ref. 5]. It made no mention of SAC, stressed that development of weapons with yields of 1-50 KT were possible[1], and that they should be deployed by a separate Tactical Atomic Air Force. Eisenhower was not sanguine about the use of nuclear weapons, noting:

> It is cold comfort for any citizen of Western Europe to be assured that--after his country is overrun and he is pushing up daisies--someone still alive will drop a bomb on the Kremlin [Ref. 6].

Just the same, the Eisenhower Administration was concerned that trying to build up conventional forces in support of the

---

[1] Smaller weapons and yields resulting from smaller amounts of nuclear material being used came about through the fusion process known as "boosting," which greatly improves efficiency in fission weapons.

U.S. at Roswell, N.M. with the 509th Bomb Group [Ref. 3]. Plans to utilize U.S. nuclear forces, such as they were, involved deploying the B-29's to bases overseas, close to the periphery of the Soviet Union, as a result of range limitations.

Until May 1949, the newly formed Strategic Air Command (SAC) was concerned chiefly with penetrating Soviet airspace and conducting a conventional and nuclear campaign similar to that of World War Two, but with greater intensity. However, concern over the size of the (then) present stockpile and perceptions of Soviet capabilities to overrun Western Europe in a veritable "red sea" led to SAC being assigned a theater mission in Europe, the goal of which would be curtailing the advancement of Soviet forces. A major problem not entirely overlooked was that the force structure present proved incapable of attacking true tactical targets, e.g., troop concentrations, transportation choke points, etc. This was a function of too small a stockpile with large yield weapons (24+ KT) that were extraordinarily difficult to handle, arrayed against a very large target base.

In the mean time, U.S. research and development in nuclear weapons technology continued to press ahead. One of the goals was reducing the size and weight of atomic weapons (thermonuclear weapons were still a few years away) to make their handling easier and broaden the platforms available to carry them. The Mark 5 "tactical" nuclear weapon (3,000 lb. with a yield of ~40

recently completed war. That more powerful means of destruction (viz. atomic weapons) were available but were only able to be carried on long range bombers (B-29's) was all the more fortuitous. This is best enunciated by General Arnold, the Chief of Air Staff on November 1945 in his Final Report to the Secretary of War, wherein he stated:

> The influence of atomic energy on air power can be stated very simply. It has made air power all important ... [The] only known effective means of delivering atomic bombs in their present state of development is the very heavy bomber ....
>
> This country ... must recognize that real security ... in the visible future will rest on our ability to take immediate offensive action with overwhelming force. It must be apparent to a potential aggressor that an attack on the United States would be followed by an immensely devastating air attack (emphasis added) on him. [Ref. 1]

U.S. nuclear capabilities in the immediate post-war environment however, did not match intent. A 1947 Atomic Energy Commission (AEC) report under David E. Lilienthal reported that the U.S. had no assembled nuclear weapons in its stockpile (as opposed to those being used for a series of tests at the time). Shortly afterward production was stepped up such that by 1948 there were 50 atomic weapons in the national stockpile [Ref. 2].

By the time NATO came into being in April 1949, the stockpile had increased to 133 weapons. However, only 30 B-29's were modified to carry these devices, the Mark IV, which were similar to the "Fat Man" [Photo 1] atomic bomb dropped on Nagasaki. These in turn were shortly followed by the improved Mark VI [Photo 2] atomic bomb in 1949. These B-29's were based in the

II. NATO AND EMERGING NUCLEAR CAPABILITIES

Democratic nations care but little for what has been, but they are haunted by visions of what will be.
--Alexis deTocqueville

The past thirty-nine years have seen an extraordinary growth in nuclear weapons in Europe. In NATO alone, the numbers of warheads have grown from 0 in 1945 to a peak of 7,300 by 1967, declining somewhat in recent years. Growth on the Soviet side has been greater in both equivalent megatonage and numbers. The result is that in terms of offensive weaponry, both sides now have over 1,000 equivalent megatons of destructive potential when their forces are summed (with a 5:1 advantage for the Soviets). In comparison, during the Second World War, the Western Allies, Soviet Union, Germany, Italy and Japan expended about 4 megatons worth of explosive power over a six-year period.

A. 1945-1952: POST-WAR DOCTRINE AND NUCLEAR WEAPONS

During the period immediately following the Second World War, debate raged in many quarters over the utility of the atomic bomb as the U.S. possessed an absolute monopoly. Predictions in the West on Soviet acquisition of atomic weapons ranged into the mid-1950's inspite of earlier warnings that it could be as little as two to five years away.

The immediate post-war debate over future force structure and doctrine was colored by unrealistic expectations arising from over optimistic assessments of strategic bombing during the

PART ONE:

HISTORICAL BACKGROUND

weapons may be employed for warfighting and deterrence purposes under any number of schemes. In the past, these systems were intended for strategic nuclear purposes and became theater-strategic by default. Technology, being the double-edged sword that it is, has permitted some theater-tactical systems to have a strategic mission as well. The list of theater-strategic weapons is rife with ambiguity. Perhaps one of the best examples is that of nuclear capable aircraft. These have a clear conventional role (close air support, air superiority, etc.) and a variety of nuclear roles up to and including theater-strategic. Other theater-strategic forces include the so-called independent nuclear forces of France and Britain.

For clarity's sake, U.S. and allied country weapons systems will be given in their popularly known form (e.g., FB-111, *Pershing* II, etc.). Soviet weapons systems will use either their U.S. designation, especially for missiles (e.g., SS-2Ø) or their NATO codeword (*Backfire*). Figures for force balances unless otherwise noted are drawn from those published by the International Institute for Strategic Studies (IISS) *Military Balance*. A glossary of acronyms (e.g., ADM, GLCM, etc.) is located in Appendix A and various figures, photos, and other pertinent data referred to in the body of the text are found in successive Appendices.

weapons systems are those that have been clearly identified as such in recognized forums such as the SALT and START process. These include land based ICBM's, long range bombers (including cruise missile carriers), and SLBM's. While recognizing these systems could have a theater role (as shall be seen later), their express purpose is ensuring strategic nuclear deterrence between the United States and the Soviet Union. Specific examples include the B-52 *Superfortress*, *Minuteman* II and III, and *Trident* C-4 for the U.S., and the *Bear*, SS-18(RS-20), and SS-N-18 for the Soviets.

Theater-tactical (also referred to as tactical) nuclear weapons are defined to be those weapons designed for battlefield use, and with ranges, yields and deployments that correspond to such use. These weapons generally reside at the opposite end of the spectrum from strategic nuclear systems by virtue of their sub-megaton (and sometimes sub-kiloton) yield; their typical employment is against specific battlefield targets, e.g., tank formations. These weapons therefore have as their rationale more of a warfighting purpose rather than strict deterrence. Specific examples include the *Lance* SRBM and so-called Atomic Demolition Munitions (ADM's) for the U.S., the *Frog* or *Scud* tactical missile series for the Soviets, and nuclear capable artillery for both sides.

Theater-strategic weapons reside between the clearly defined nodes of strategic and theater-tactical nuclear weapons. These

through arms control measures. A critical summary on nuclear doctrine closes this part, providing a transition to part two. Part two begins by examining the present situation technologically and quantitatively today in Europe. This "balance" is then examined in terms of the security concerns of the Soviets and of NATO. Finally, a range of strategies or options are offered for both immediate implementation and future goals.

The reason for the historical approach lies in the fact that only a solid grounding in the events of the past 35 years yields clarity of understanding of the problem of theater nuclear weapons in Europe. Far too much of the contemporary literature takes an unhistorical approach in favor of a quantitative one with emphasis on the present. The result is a body of material that ignores non-quantitative influences and developments, and, as a result, covers only part of the problem.

B. DEFINITIONS AND TERMINOLOGY

One of the sources of ambiguity and thereby controversy has been the question of what constitutes theater nuclear weapons. By mutual agreement, these (also known as "grey area") systems have been excluded from past strategic arms control negotiations for reasons stemming from this definitional controversy.

For our purposes nuclear weapons systems (warheads and delivery vehicles) will be classified as strategic nuclear, theater-strategic, and theater-tactical. Strategic nuclear

I. INTRODUCTION

The first components of the Ground Launched Cruise Missile (GLCM) scheduled for deployment in Europe arrived in England on November 14, 1983. These were followed shortly thereafter by the arrival of the first *Pershing* II's in the Federal Republic of Germany. In all, a total of about 41 long range theater nuclear weapons were added to the inventory of NATO by year's end. This was not an inconsiderable number, but when viewed within the framework of the total number of NATO and WTO theater nuclear systems the size of the deployment certainly paled in comparison.

Yet plans for this deployment provoked mass demonstrations in Europe, both East and West, and brought forth a massive Soviet diplomatic offensive to counter it. Ultimately the Soviets used the deployment as a pretext for leaving the INF and START talks. The question must be asked as to how such a seemingly small modernization program could provoke such an extraordinary chain of events.

A. SCOPE AND PURPOSE

This thesis is divided into two parts. Part one examines, within a historical framework, the development of U.S. and Soviet theater nuclear warfighting doctrine, force structure, and its relation to strategic nuclear and conventional warfighting doctrine through the present. Included in this section is a survey of attempts to curb the proliferation of these forces

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wounded. Casualties or long term effects from fallout were not included [Ref. 7][1]. Although rigorously suppressed, these results were leaked, causing enormous consternation among the German populace and contributing directly to the anti-nuclear campaign that peaked in 1957-58 (*Kampf dem Atomtod*, literally "Struggle Against Atomic Death"). It also tremendously complicated the rearmament program of the Adenauer government.

During this same period (1945-57) the British and French were working on development of their own nuclear capability. During the war, the British had collaborated with the U.S. on the Manhattan Project (under the code name of the "Tube Alloys Project") and as a result had a considerable lead over France such that the first British device was exploded on October 3, 1952. In 1950, the U.S. gave the British their first nuclear capable platform in the form of 70 B-29's (renamed *Washington* Mk. 1's)[2] which were capable of reaching Soviet territory. By 1956-57, they were testing thermonuclear weapons with the *Valiant* B Mk1 strategic bomber, a delivery system that had a secondary or European theater delivery role as well. Additionally, the British began IRBM development in 1954 with the *Blue Streak*. This was intended to be a silo-based, second strike weapon, but was eventually canceled due to a combination of

---

[1]Similar results were noted in exercises held in the U.S. (e.g., *Sagebrush*).

[2]These were not sent configured to carry nuclear weapons though.

technical/strategic obsolescence and economic factors. The predominance though of U.S. nuclear capability and doctrine was formalized in 1956 when NATO adopted the doctrine of massive retaliation in MC 14/2 [Ref. 8].

Yet the Atlantic Alliance was far from untroubled towards the close of the decade. In Germany the fallout from "Carte Blanche" was felt in the wrath of the Social Democrats and some military experts who charged that German rearmament and participation in NATO would not provide protection from invasion. Rather, they claimed that even with 500,000 German soldiers, NATO strategy guaranteed Germany would become a battlefield, and the battle would not remain conventional [Ref. 9]. Therefore, the argument continued, German units in NATO would be useless for defending Germany since they would only collaborate in a strategy that would ring down the curtain of nuclear catastrophe on the European stage. Reinforcing this view were public opinion polls which showed the European public preoccupied with the fear that NATO might turn Soviet aggression into nuclear war.

Following the controversy in the press (after "Carte Blanche") and public apprehension about NATO strategy, the Adenauer government contradicted the deterrence theory underlying massive retaliation (viz., that the threat of escalation to all out nuclear war would deter Soviet aggression). It stated that eventual Soviet-U.S. nuclear parity would make conventional war all the more inevitable and thus give greater import to conventional forces in the balance of power [Ref. 10].

Another offspring of the nuclear debate in Germany that gained momentum following "Carte Blanche" was the nascent peace movement. The nuclear issue, while having its roots roughly in mid-1954, peaked during the five-month *Kampf dem Atomtod*, when hundreds of thousands of West Germans took to the streets in anti-nuclear demonstrations [Ref. 11]. This followed the passage of Adenauer's armaments program by the Christian Democratic dominated *Bundestag* in March 1958. Support of the movement within the government resided with the Social Democrats (SPD). The Social Democrats had opposed Adenauer's measures the year before, and subsequently suffered defeat in the November elections. Following the *Kampf dem Atomtod*, SPD support for the movement (which had begun to decrease) withered away following sweeping Christian Democrat victories in North Rhine-Westphalia, a traditional stronghold for the SPD [Ref. 12].

Naturally this set of nuclear problems went hand-in-hand with the others of the day facing NATO--Suez, the uprisings in Poland and Hungary, etc. Certainly these were very deep and troubling problems, but one event in 1957 did more to change perceptions of troubles within NATO than anything else. That event was the launch and successful orbiting of *Sputnik* 1 on October 4, 1957. The perception (though later recognized as hardly justified) was that the strategic equation had changed in favor of the Soviets since the advent of Soviet ICBM's placed the U.S. homeland at direct risk. Given this situation, the U.S.

would be less inclined to use nuclear weapons in deterring war in Europe and thus served to renew fears of the U.S. de-coupling its nuclear guarantee (i.e., the U.S. would become unwilling to trade New York for Paris). In fact though, the opposite seemed to be the case because the U.S. built it's nuclear capabilities in Europe, both as a means to counter the strategic threat presumably posed by Soviet ICBM capability, and to bolster its warfighting capabilities in Europe.

C. SUMMARY

By the close of the decade, the nuclear capability of NATO in general, and the U.S. in particular expanded dramatically. For the U.S. alone, the national stockpile grew from 450 warheads in 1950, to over 18,500 in 1960 [Ref. 13], an increase of more than 4,000%. Delivery systems grew in like manner. In 1950 the Navy began deploying the AJ *Savage* off *Midway* class carriers in the Mediterranean, a move which gave the Navy a strategic nuclear strike mission against the south-western regions of the Soviet Union. With deployment of *Forrestal* class attack carriers and the A-3 *Skywarrior* beginning in 1955, this capability was significantly enhanced.

As previously mentioned, increasing numbers of fighter-bombers coming on line were nuclear capable (including the entire "Century-series" of fighters). The first ground launched cruise missile, the Matador, became operational in 1951. The Strategic Air Command counted 20 overseas bases, including bases in French

Morocco, Spain, and Britain. The first IRBM, the *Thor*, became operational the summer of 1959 in England with the RAF. The RAF supplied personnel, but SAC liaison officers controlled the nuclear warheads. A second IRBM, the *Jupiter*, was being prepared for its first deployment the following year in northern Italy.

As strategic weapons capability grew, so did tactical or battlefield capabilities. The Army in particular was deploying a wide range of battlefield missiles and nuclear capable artillery. The better part of the nuclear weapons buildup by the end of the decade stemmed from the emphasis on tactical weapons; bombs, artillery shells, etc.

III. EARLY SOVIET NUCLEAR DOCTRINE

A. SOVIET MILITARY DOCTRINE AT WAR'S END

Soviet military doctrine on the Western front by the end of the Great Patriotic War might well be characterized by one quality--mass. Commenting after the war on one aspect of the Soviet style of fighting, Major General F.W. von Mellenthin wrote:

> ... Russian artillery is also employed in mass. Infantry attacks without artillery preparation were rare, nor does Ivan care much for short bombardments in order to gain surprise .... The preliminary bombardment usually lasted two hours and their gunners had standing orders to fire off the ammunition ration for one to one and a half days during that period. Under such concentrated fire the thin German lines were usually plowed upside down in a very short time [Ref. 14].

The Soviet preoccupation with mass is echoed as well by General Herman Balck and Lieutenant General Heinz Gaedcke, other German commanders serving on the Russian front. General Balck stressed that mere numbers were not always guarantors of Soviet victory. The Soviets lacked flexibility and innovation. They (the Soviets) held to predetermined and extensively wargamed plans such that when suddenly faced with an unpredicted or novel situation on the battlefield they were prone to be either paralyzed or to withdraw. General Balck cites as one example an instance in Budapest wherein he successfully attacked 45 Soviet divisions with 7 to 9 of his own (odds at best of 5:1) by taking advantage of this characteristic of Soviet forces.

Yet in the end Soviet forces prevailed by virtue of sheer numbers and the eventual opening of two fronts in the west by the Western Alliance. At the end of the war, Soviet forces numbered roughly 11.36 million men in arms [Ref. 15] and the Soviet Union was securing dominance in eastern Europe by virtue of its occupation forces. To the Soviet people in April 1945, the Soviet Union had won a great victory but at a staggering cost in human and material losses. Barely three months later though it would seem for naught with news of the atomic bomb dropped on by the U.S. Writing after the war, Alexander Werth noted this change in fortune:

> ... the significance of Hiroshima was not lost on the Russian people. The news had an acutely depressing effect on everybody. It was clearly realized that this was a New Fact in the world's power politics, that the bomb constituted a threat to Russia, and some Russian pessimists I talked to that day dismally remarked that Russia's desperately hard won victory over Germany was now "as good as wasted." [Ref. 16]

B. STALIN'S EFFECT ON POST-WAR NUCLEAR DOCTRINE

The primary contribution of Stalin to military doctrine of the period in question lies in his "Five Permanent Operative Factors." Briefly, these were:

1) Stability of the rear,
2) Morale of the Army,
3) Quantity and quality of divisions,
4) Armament, and
5) Organizing ability of command personnel [Ref. 17]

These factors were introduced in 1941 and in concert with reverberations from the purges, tended to dominate military thought during and after the war. In fact, Stalin's operative factors became the be all and end all that would determine future wars--all else was subordinate. Stalin thereby made a virtue of necessity and believed that in fulfilling these preparations, victory would be predetermined [Ref. 18].

Two elements were notable by their absence; the role of surprise, especially that of strategic surprise, and the use of nuclear weapons. In the case of the former, Stalin had been very unpleasantly surprised when the Germans opened Operation *Barbarossa* on 22 June 1941. This happened inspite of a multitude of warnings from a variety of sources. The Soviet ambassador to Japan had even passed along the date and time of the invasion. In light of his failure to act on any of these warnings, it is probable that Stalin refused to allow discussion of surprise in warfare since this in turn would highlite his own failure.

The case of nuclear weapons is different. Soviet research and development in the field of nuclear physics was well advanced and nearly on par with that of the West in the late 1930's. On the eve of the Battle of Stalingrad, Stalin had the State Defense Committee issue a directive establishing an atomic program, with V. I. Kurchatov in charge [Ref. 19]. Following the conference at Potsdam during which Truman revealed the American achievement in atomic weapons, Stalin pressed Kurchatov to speed up the program.

Yet nuclear weapons, especially in the theater role, were deemed to be of secondary value. Principal reasons for this included politics, Marxist-Leninist thought, and practicality. Nuclear weapons were not viewed as decisive weapons within the framework of Marxist-Leninist thought. If they were, then technology in the form of nuclear weapons would be supreme to the dialectic insofar as their ability to determine the outcome of some future war. This would also invalidate Stalin's operative factors. Instead, they were viewed as weapons providing merely a "bigger bang."

Stalin probably played down the role of nuclear weapons in public as an important weapon in war based on the force imbalances between the U.S. and themselves, particularly in Europe. According to NSC-68 [Ref. 20], the U.S. had projected the Soviet stockpile to have 10-20 weapons by mid-1950 and up to 200 by mid-1954 [Ref. 21]. However, recent studies now seem to indicate that outside of a small handful of experimental devices, the Soviets had no weapons in their stockpile until 1953 [Ref. 22].

There were other, more practical reasons for the low degree of emphasis on the role of nuclear weapons. Soviet commanders and theoreticians were just as uncertain, if not more so, as their American counterparts on the actual utilization of nuclear weapons. Concerns over fallout effects in East Europe as well as the western regions of the Soviet Union following use in Central Europe were certainly present. Additionally there was the problem of the delivery vehicle. The only means the Soviets had

for delivering atomic weapons were by means of copies made from impounded American B-29's. This aircraft, the Tu-4 *Bull*, had the same attendant problems as the B-29, namely range and an unhealthy proclivity towards inflight engine fires.

It was able to reach the U.S. on one-way missions (although questionable on the matter of mission success due to the U.S. continental air defense capabilities). However, it most probably would have been employed in a theater role against U.S. and British forces, or the strategic rear. Even then, the likelihood of any degree of major success was significantly diminished as long as this platform was the sole means of delivery. This problem would soon be resolved with the convergence of two events; development and deployment of medium range jet bombers and long range missiles[1], and development of thermonuclear weapons. The medium range (and later long range) jet bombers increased the survivability expectations of air-delivered weapons. More important though was the quick, long range employment of nuclear weapons offered by the synthesis of missiles and thermonuclear warheads[2].

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[1]Rocket development had begun in 1945 using competing design bureaus consisting of Russian and captured German scientists. The first all Russian ballistic missile, the R-1, was built in 1947, and a prototype of a 7,000 km range missile already existed by Stalin's death, according to Khrushchev who was surprised upon learning of it.

[2] Thermonuclear weapons allow the payload size and weight requirements for missiles to be reduced without sacrificing yield. Another advantage is that this made up to a certain extent for the poor accuracies of the early missiles.

However, the hub of military doctrine remained with the Army and artillery. Everything else, including nuclear weapons and their means of delivery, was in support of these branches.

Compare the following statement by Colonel General of Aviation Nikitin in Military Thought (1949) with the earlier statements made by his American counterparts regarding air power and nuclear weapons:

> Soviet military science considers that the outcome of war under contemporary conditions is decided on the field of battle by means of annihilation of the armed forces of the enemy. This definition of the fundamental mission of aviation is not contradicted by the need to employ part of its forces to strike the deep rear of the enemy, on his military-industrial targets, *but our military science does not consider such blows an end in themselves, but only a helpful means of creating favorable conditions for the success of the combat operations of ground and naval forces* {emphasis added} [Ref. 23].

C. SUMMARY

It is clearly seen that emphasis still lay with the battle on the fronts, with the rear (in the case of the European theater, the British Isles and the U.S.) ranking secondary in importance. This in part stemmed from the position of the Soviet army as first among equals, and the dim view the Soviets took of the results from the strategic bombing campaign of the Western Allies during the war. To a certain extent it may also be chalked up to limited Soviet long range strike capabilities needed to carry out such a strategy.

By the time of Stalin's death in 1953, the technological groundwork was fairly well in place for the instruments of

theater nuclear forces (TNF). Yet the legacy of Stalin was such that it wasn't until after his death that his operative factors began to be challenged and Soviet military considered alternatives.

IV. KHRUSHCHEV: THINKING THE UNTHINKABLE

A. 1953-55: POST-STALIN

There were two developments of note during the period immediately following Stalin's death. One was a political debate over the role nuclear weapons would play in a war with the Western coalition and the other developed in the military over the utility of Stalin's operative factors.

In the case of the political debate, there were two camps, one led by Malenkov, Chairman of the Ministers, the other by Khrushchev. Malenkov argued for the creation of a large deterrent force based on thermonuclear weapons. He believed this would force the West to realize the futility of nuclear war, and thereby make war between the opposing systems impossible [Ref. 24]. It would seem Malenkov was pressing for a form of assured destruction, directly contradicting tenets of Marxist-Leninist doctrine on the inevitability of war between capitalism and socialism.

Standing in contrast to this was Khrushchev who held to the more doctrinally orthodox view that the notion of a weapon that could halt the inexorable march of history was contrary to Marxist-Leninist dictum. Rather, he held that through proper planning by Soviet military science, the Soviet Union would be able to fight a nuclear war and emerge victorious.

The second development revolved around a growing split in the Soviet military over Stalin's operative factors. The debate was not so much the future utilization of the factors as it was over their continued exclusiveness. Other elements began to be discussed, chief of which was the element of surprise. The advent of nuclear weapons had led some in the military to believe that a massive surprise nuclear strike would cause such damage as to make recovery impossible.

The process began with an article appearing in the September 1953 issue of *Military Thought* by the magazine's editor, General Major N.A. Talenskiy entitled "On the Question of the Laws of Military Science." Talenskiy did not challenge Stalin's operative factors, but rather implied these principals were not basic [Ref. 25]. Talenskiy's article was a bit premature as the debate was still raging, and the leadership succession hadn't been consolidated. As such it wasn't ready to accept any changes in doctrine just yet.

As far as theater planning went though, nuclear weapons were still not considered to be decisive for a number of reasons. One was still a matter of practicality, that is, continued reliance on the manned bomber. Smaller "tactical" weapons were being developed by the Soviets but were not yet deployable.

B. 1955-64: NUCLEAR WEAPONS ASCENDANT

In 1955 five nuclear explosions were detected in the Soviet Union. The first two were air bursts with yields of about 5 and

to heightening the awareness of the troops and general populace about nuclear war. In the latter case it took the form of conditioning to ensure quick reactions to ensure survival of vital elements of the military and industry.

This "revolution" centered on general nuclear strategy, that is, long-range nuclear missile attacks against the U.S. and the decisive qualities inherent in them. The effect on theater nuclear planning was more subtle, serving to ratify the decisive nature of preemptive strikes against elements of the enemy's TNF and strategic forces.

By 1968 a modification to Soviet doctrine had emerged. This was the belief that the initial phase of the war (general or global) would begin with conventional or nuclear strikes in concert with combined arms, within the relevant theaters of military operation (TVD's). In part this may have stemmed from knowledge gained by the Soviets in their major series of nuclear weapons tests running from 1961 through the signing of the partial test ban treaty in 1963. This series of over one hundred tests (including the test of the largest thermonuclear weapon to date [Ref. 38], reportedly 55+ MT[1]) served among other things to give the Soviets a large database on the effects of electromagnetic pulse (EMP) and what battlefield employment of nuclear weapons might entail. The results of these experiments

[1] Khrushchev claimed the Soviets had in fact exploded a 57 MT device with the destructive effects of a 100 MT device at the time.

question over what to do in upgrading NATO's theater nuclear forces, Helmut Schmidt argued that instead of being unilaterally retired, these weapons systems should have been modernized instead [Ref. 36].

Here we see a dichotomy between U.S. force planning, where these systems were viewed as mere stop gap measures until the ICBM buildup was complete, and the European view which focused on a more permanent role. Additionally, the perception (though inaccurate) that the IRBM's were withdrawn as some part of a quid pro quo reached between the U.S. and the Soviets following the Cuban Missile Crisis, led to some deeply troubling implications for European leaders. Namely, it appeared the U.S. might be all too willing to trade a perceived guarantor of deterrence in Europe for American security alone. This would be one of the underlying issues between the U.S. and the European members of NATO in the forthcoming SALT negotiations.

B. 1963: THE SOVIET "REVOLUTION IN MILITARY AFFAIRS"

> The revolution in military affairs is an accomplished fact. It led to basic quantitative and qualitative changes in the military-technology base of the Armed Forces and in its structure. It marked a revolution in the methods of waging war, revolution in the theory of military art and actual combat training of the troops [Ref. 37].

The "revolution in military affairs" began late in 1962 and continued well through Khrushchev's fall from power. In essence, this "revolution" was first of all, the education of the officer corps and other members of the Politburo, and eventually extended

though, President Johnson let the MLF die a quiet death which in large measure, contributed to the downfall of the Erhard government in October 1966 [Ref. 35].

Skybolt was meant to be an +1,800 km, air-launched ballistic missile designed to be carried by U.S. B-52's and British *Vulcan* and *Victor* bombers. The U.S. had strongarmed the British into cooperation on the project only to unilaterally cancel it for technical and economic reasons, leaving the British government in the lurch. In an effort to compensate the British for their losses, the U.S. first offered to turn over the plans to the British government, and later offered to share development on the *Polaris* SLBM. The French were later offered a similar partnership but turned it down.

In the meantime, NATO's theater-strategic force structure experienced many important changes that climaxed in the period 1967-68. These occurred as a result of the withdrawal and retirement of the B-47 medium range bomber, *Mace B* cruise missiles [Photo 4], and *Jupiter* and *Thor* MR/IRBM's. The removal of these systems placed the medium range burden on the *Pershing* 1 (and later 1A) missile with a range of 800 km as the sole medium range weapon, and imposed additional burdens on long range forces, such as "dual capable aircraft" (DCA's). To a certain extent, SLBM's were figured in as the *Poseidon* was deployed, but these were affected by other factors relating to political (e.g., SALT) and military (more of a countervalue, second-strike weapon) restrictions. Commenting on this in October 1979 when facing the

to Moscow and Washington, leaving Europe unscathed. This latter thought is naive given the global devastation inherent in an exchange of strategic nuclear forces between the U.S. and Soviets.

There were other events during the course of this decade that gave the Europeans justifiable cause to question the commitment of the U.S. nuclear guarantee. Among these were the multilateral force fiasco, the aborted *Skybolt* missile project, and the withdrawal of U.S. MR/IRBM's from Europe.

As envisioned, the multilateral force (MLF), under one of its many schemes, would have consisted of ships manned by international crews carrying MR/IRBM's and cruise missiles with joint decision making on nuclear weapons employment[1]. This was proposed in part to placate the Germans who were pressing for a greater role in the nuclear weapon employment decision process, and in part to counter the burgeoning independent nuclear forces of Britain and France. The Kennedy Administration was thoroughly enamored with the concept and pressed the Europeans to accept it. While the force never fully materialized, it nonetheless caused problems, primarily with the Germans. Following intense lobbying by the U.S., the Germans under Fritz Erhard signed on choosing to forgo better relations with France. As matters turned out

[1]The nuclear powered cruiser *Long Beach* (CGN-9) was originally intended to be fitted out with *Regulus* II cruise missiles and eight *Polaris* missiles.

This effort yielded a wide margin of strategic forces--for strategic deterrence purposes. Nevertheless, the stockpiling of existing theater nuclear weapons, particularly tactical warheads, continued and reached a peak of 7,300 under McNamara by 1966.

With the emphasis then on conventional forces in the European theater, it would seem logical that some measure of relief would have been in evidence among the West Europeans, and especially the Germans who stood to have their territory turned into an irradiated wasteland. This was not the case though. Concern in Europe over de-coupling of the U.S. nuclear deterrent rose anew with this very emphasis on conventional forces. The rationale behind this concern was that as conventional forces gained a larger mission, the Europeans would end up bearing more of the burden for defense while the role of deterrence was lessened through de-emphasis of U.S. nuclear forces.

The underlying element in this scheme of thought is two fold. First, the Europeans prefer to think in terms of deterring war in Europe rather than preparing a sufficient defense against war should it occur. Another war would devastate Europe, even if it remained conventional, which most believed (and still do) that it would not. The successful defenders would be left with the proverbial smoking, radiating ruin of a phyrric victory. Deterrence was also cheaper economically and in terms of manpower. In addition, the Europeans harbored secret hopes that in a future war they would be relegated to the role of bystanders watching the missiles fly overhead on their respective journeys

As mentioned, flexible response envisioned more of a role for conventional forces than had massive retaliation. These forces were sorely neglected in the aftermath of Korea, *Sputnik* and emphasis on the "nuclear battlefield" which predominated the late 1950's. Army organization and training heavily emphasized tactical nuclear warfare, with over 50% of the Command and General Staff College curriculum devoted to atomic battlefield tactics, and development of the "pentomic" division [Ref. 33].

A massive building program for strategic nuclear arms was underway which produced the *Minuteman* and *Titan* ICBM's, the *Polaris* SLBM, and served to increase the numbers of manned superiority over the Soviet Union which was having major problems in the production and deployment of their ICBM's. Therefore, in addition to enjoying this large margin of strategic superiority (8,000 total equivalent megatons (EMT) for the U.S. vs. 800 total EMT for the Soviet Union [Ref. 34]), the U.S. also enjoyed a strong measure of invulnerability to Soviet attack. The combination of these factors was such that a preventive war against the Soviet Union was presented to Kennedy (and quickly dismissed) during the 1961 crisis over Berlin.

For all the planning with regards to conventional and strategic forces though, little was done with theater nuclear

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[1] See Wells, S. "The Origins of Massive Retaliation," Political Science Quarterly, Vol. 96, No. 1 (Spring 1981): 31-52. bombers for SAC.

V. CHANGES IN AMERICAN AND SOVIET DOCTRINE

The 1960's brought numerous changes in American and Soviet, and by implication, in NATO and Warsaw Pact doctrine. France joined the nuclear club in 1960 and Communist China followed a few years later. By 1962 the U.S. IRBM deployment in Europe was complete with the *Thor* operational in England and the *Jupiter* in Northern Italy (Figure 2). The *Jupiter*'s deployed in Turkey never reached full operational status. These events combined to complicate Soviet theater nuclear war planning.

A. 1960: FLEXIBLE RESPONSE

Following the election of John F. Kennedy in 1960, renewed emphasis was placed on improving conventional forces in the theater, and building strategic nuclear forces. All this fell under the aegis of "flexible response." Flexible response is a symetrical, proportional response to aggression. Ostensibly this provides the President with options other than immediate escalation to a general strategic nuclear exchange in the event of aggression, as was the presumed case under massive retaliation. In later years some revisionists have argued that massive retaliation was in many respects similar to flexible response[1], even calling it "flexible retaliation." However, that was not the general perception when the Kennedy Administration introduced flexible response in 1961-62. NATO adopted flexible response formally in 1967 with MC 14/3.

The importance of nuclear weapons evolved from an almost secondary role under Stalin to a position of being seen as potentially valuable with combined arms, and by 1962, stood on the threshold of being viewed as decisive. The main mission for Soviet TNF initially was the disruption of the enemy's strategic rear. This grew in time to include destroying his long range air power and eventually included the destruction of the sum of his TNF through early, preemptive use of nuclear weapons.

General nuclear war itself was seen as inevitable under Stalin and as such, limited nuclear war (as thought of in the West) was not even considered. Khrushchev eventually held that while a general nuclear war was still possible, it was no longer fatally inevitable. Here too though, limited nuclear war was dismissed out of hand.

Nevertheless, Soviet efforts in developing and acquiring nuclear weapons across a broad spectrum continued. The underlying rationale was the concept of damage limitation, a concept which required, at the very least, parity, if not superiority in arms at all levels--offensive and defensive.

especially the case in Europe given the short flight times and low probability of detection. Additionally, nuclear war would entail large scale damage to the Europeans since a large percentage of U.S. FBS were stationed there. Ultimately then, the U.S. would be deterred from engaging the Soviet Union in nuclear war, and Europe was held hostage to guarantee this outcome.

A combination of factors soon emerged to put to question the validity of this doctrine, which in and of itself was recognized as a temporary fix. Many of the elements comprising U.S. FBS in Europe were removed during this decade (see chapter V), and hence, the original need for the emplacement of the SS-4 and SS-5 was declining[1].

Yet they began to gain increasing significance as theater-strategic weapons in their own right. However, this would not become evident until the mid-late 1960's when the Soviets would genuinely exploit their benefit.

C. SUMMARY

Before proceeding to the next chapter, it would be useful to summarize the role of nuclear weapons in Soviet theater warfare planning to this point (1962).

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[1] With the possible exceptions of the need to target the SSBN bases in Holy Loch and Rota, the F-111 bases in England, and the embryonic British and French independent nuclear forces by mid-decade.

The decision by Khrushchev to undertake this large scale deployment of MR/IRBM's rested primarily on two factors, one materially related, the other oriented toward the balance of strategic forces. Materially, Khrushchev was faced with either ordering full production and deployment of the first generation ICBM, the SS-6 and thereby suffer its attendant drawbacks, or deploy a limited number of SS-6's and a larger number of medium range missiles, the SS-4 and SS-5 (Figure 1), while pressing development of the second generation ICBM's (SS-7 and SS-8).

Khrushchev's decision was not made in a vacuum, exclusive of the balance of Soviet strategic forces arrayed against those of the U.S. and its allies. By following the latter path, Khrushchev hoped to offset the forward based systems [FBS] based throughout Europe and North Africa. This course of action provided a temporary remedy to a part of the strategic force imbalance while awaiting development and deployment of the second generation ICBM's which in turn would redress the gross strategic balance.

The scenario that developed by the early-1960's was a miniaturized version of the by now infamous "missile gap" debate of the 1959-60 period. Theoretically, Soviet superiority in missile forces was such that the U.S. FBS could be effectively removed in a first strike during the opening stages of conflict, thereby removing a not inconsequential portion of the U.S. nuclear strike capability against the Soviets. This was

range missiles would be decisive factors in any future war. The basic objective by 1960 was to "try to achieve victory with a short war (by a lightning strike) but be prepared for a prolonged war." [Ref. 31]

A question may arise as to how this doctrine, oriented to what appears to be strategic concerns, relates to theater nuclear doctrine and force structure. When one considers the fact that U.S. strategic forces were deployed overseas along the periphery of the Soviet Union and the fact that war in Europe would very likely lead to general war with the U.S., then the distinction between theater and strategic becomes very fuzzy. In this conflict (European theater) it became important to neutralize as quickly as possible the forward based systems (FBS) of the U.S., destroy the budding independent nuclear forces of Britain (and later France), destroy or at least wreak great havoc upon the strategic rear areas of the Western coalition, and preserve the better part of continental Europe for post-war exploitation. Hence the need for large numbers of MR/IRBM's and other theater nuclear forces combined with large numbers of conventional forces for battle was established.

Indeed it would seem this policy was emplaced about 1958-59 and reached fruition by 1964, when 609 MR/IRBM's [Ref. 32] were in place and aimed at Europe--the "hostage Europe" doctrine. A closer examination of this situation is warranted as the ongoing controversy of the SS-20 deployment finds its roots in this decision.

strategic role (i.e., attacks against the continental U.S.), the *Bear* and *Bison* had a marginally effective theater role, particularly when the former was armed with stand-off weapons.

It also becomes apparent which side was gaining the upper hand in nuclear doctrine--namely the faction headed by Khrushchev. Malenkov, who had argued for an assured destruction form of strategy, was forced out of the government in 1955. For the West, this bore a heavy portent. Khrushchev's reasoning lay in the concept of damage limitation and the idea that not only could a nuclear war be fought, but given the proper preparations, the Soviet Union would emerge victorious.

Indicative of Khrushchev's influence was the Twentieth Party Congress in 1956. It was during the gathering of this august body that Khrushchev made his now famous "secret" speech denouncing Stalin. During the course of this revelation, Khrushchev called for a major reexamination of questions of military science. The outcome of this was the establishment of a conference in May 1957 and a series of seminars the following year conducted in secret with participation by high-ranking Soviet officers. The general conclusion reached was:

> [T]he introduction and synthesis of nuclear weapons and the long-range missile had brought about radical changes in all aspects of warfare. As a result, major revisions in basic concepts were mandated [Ref. 30].

Khrushchev himself followed these proceedings along with members of the Politburo. Their conclusions were essentially the same, namely that the combination of nuclear weapons and long

test in October 1952. Granted, it was not a "superbomb," but unlike the U.S.'s purely experimental "Mike" device, it was in warhead (i.e., deliverable) form.

The U.S. was also engaged in missile research after 1945, but by 1947 it was subordinated to manned bombers by the newly formed Air Force and left to the Army. The Soviets though pressed on with ballistic missile research. In part this stemmed from the perceived lead the U.S. had in manned bombers and the dismal failure of the Soviets to match the U.S. in this capability. In a move that was characteristic of Soviet policy in this situation, the decision was made initially by Stalin and later fully implemented by Khrushchev that rather than compete with the U.S. head-to-head in a field where the U.S. held a substantial technological and quantitative lead, to leapfrog that field to another and thus hopefully make the U.S. weapon system obsolete. By going to missiles instead of bombers, intercontinental ranges became (eventually) attainable and the concern over penetrating air defenses, long flight times, and bombers hampered by poor in-flight refueling capability or overseas bases to launch from was obviated. At the same time it was important not to appear to unilaterally concede a given field to the adversary, thereby maintaining the justification for the mobilization of heavy industry. Hence the reason to continue deployment of the virtually useless *Bison*, and to develop and deploy the turboprop *Bear* manned bombers in the mid-fifties. In spite of their dismal

25 KT apiece and apparently used plutonium warheads of small and medium size [Ref. 26]. The Tu-16 *Badger* and Mya-4 *Bison* jet bombers were operational, and the SS-3 with a range of 1,000 km entered service. According to Miller [Ref. 27] these SS-3's may have been what Marshall Krylov was referring to when he stated that "by 1955 there were in the Soviet army several missile units armed with medium-range missiles [Ref. 28]." The Soviet Union finally entered the field of theater-tactical nuclear weapons.

The question arises that given a superficial examination of the debate over the use of nuclear weapons during the previous 10 years, how is it that the Soviets seemed bent on acquiring theater nuclear forces in quantity if they were not deemed decisive, especially given the cost of diverting scarce research and development resources ? The casual observer might be quick to point out the Soviets were merely "mirroring" the U.S. and NATO theater nuclear force deployments. In fact, they were not; several factors bear this out.

Soviet nuclear and missile research developed independently of American efforts although they began at similar times. Holloway [Ref. 29] points out that while American efforts may have provided some stimulus to Soviet efforts, particularly in regard to early thermonuclear work, the decision to proceed to development of the fusion bomb following the fission bomb was due to internal dynamics. This is evidenced by their use of lithium as a fuel source (vice deuterium or tritium) and the explosion of a thermonuclear device barely 10 months after the U.S. "Mike"

may have put questions in the minds of Soviet planners as to their ability to manage a theater nuclear war.

There is a school of thought that argues this change in doctrine merely copies the U.S./NATO policy of "flexible response." There are some attendant problems with this approach though. NATO did not adopt flexible response until 1967 (although the U.S. had announced it in 1961-62). Additionally, official Soviet statements condemned flexible response from its inception under the Kennedy Administration. This same school also tends to overlook the fact Soviet doctrine holds that the initial, conventional phase will be brief and that it will escalate to general nuclear war. The fact it may begin with a conventional phase also does not exclude the possibility it could still begin with massive nuclear strikes. Therefore, in transforming what is most likely an adjustment of current doctrine into an entirely new doctrine, this school of thought is probably indulging in a form of wishful "mirror-imaging." It is interesting to note this appeared at roughly the time when limited nuclear war was beginning to be thought possible in the West and it coincided with the opening of the SALT process, an action in itself that would have a large impact on Soviet theater nuclear force structure.

C. SUMMARY

By the end of the decade and on the eve of the SALT process and the Nixon Doctrine, NATO found itself in something of a quandary. After adopting flexible response in 1967, the force structure was anything but flexible. Conventional forces never came close to meeting the 96 divisions agreed to at the Lisbon Conference. Conventional strategy became one of forward defense, with the vast majority of ground forces concentrated in the eastern regions of West Germany with hopes that these would offset the numerical superiority enjoyed by WTO forces. Early use of tactical nuclear weapons implied escalation to theater-strategic weapons, yet here the force structure was woefully inadequate as a result of the previously mentioned unilateral redeployments and retirements taken by NATO, more specifically, by the U.S. The U.S. strategic force structure (insofar as the true counterforce weapon, the ICBM, was concerned) was just beginning to lose ground to that of the Soviets quantitatively and in some respects qualitatively (with the advent of the first "heavy" ICBM, the SS-9). U.S. strategic doctrine at this point had experienced transformation from assured destruction to mutual assured destruction (MAD), while Soviet strategic doctrine focused on warfighting ability and damage limitation. Unfortunately, U.S. and NATO policymakers ignored this divergence in views, instead projecting their beliefs on the Soviets and thereby assuming they (the Soviets) held like-minded views.

The result of all this, on the theater nuclear warfare level, was rigidity instead of flexibility due to quantitative superiority of Soviet theater-strategic forces. The nightmare of Carte Blanche was magnified. Whereas NATO had previously been assured that under massive retaliation the bulk of destruction would be roughly limited to the enemy and its territory (which was cold comfort to West Germans whose territory stood to be overrun and occupied first); under these circumstances the West could no longer be assured of such an outcome. At this point, NATO's theater nuclear employment doctrine became obsolete.

VI. SUFFICIENCY AND SALT

A. 1969: THE NIXON DOCTRINE AND SUFFICIENCY

The Nixon Doctrine was proclaimed in July 1969 and consisted of three points:

1) The United States would keep all of its treaty agreements;

2) The U.S. would provide a shield if a nuclear power threatened the freedom of a nation allied with it or of a nation whose survival was considered vital to the security of the U.S., and;

3) In cases involving other types of aggression, the U.S. would furnish military and economic assistance when requested in accordance with treaty commitments. However, the nation directly threatened would assume primary responsibility of providing manpower for its defense [Ref 39].

Ostensibly this was the justification for the "Vietnamization" program, but extended to NATO it signaled a desire to reduce the burden borne by the U.S.

The Nixon Doctrine combined with the policy of "detente" and the SALT talks may be subsumed under the idea of strategic sufficiency. Under this concept, the U.S. recognized the Soviet buildup which had continued through the late 1960's and acknowledged that a "rough parity" existed from about 1970 between the U.S. and Soviet strategic forces. There are four criteria that may be applied to the sufficiency doctrine; the

existence of "adequate" second strike forces[1]; U.S. and NATO forces were postured to enhance "crisis stability"[2]; the U.S. should have or appear to have parity with the Soviets and be seen to be equivalent with the Soviets in capability to inflict damage; and, the U.S. must provide for defense against a "light" attack[3]. With this in mind, the U.S. entered into SALT negotiations with the Soviet Union, a process that would hold implications not only for strategic forces, but for NATO and WTO theater nuclear forces as well.

B. IMPACT OF SALT--NATO

Until recently, there have been few European critics of SALT since the process began in 1969. According to Rowen the underlying factors to this apparent European indifference to the role SALT played in European security is attributable to their (the Europeans) commitment to detente, and traditional deference to the U.S. on "strategic" nuclear matters [Ref. 40]. The exception to this concerned the FBS issue. Primarily at stake

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[1]Adequate second strike forces were defined during the latter years of McNamara's tenure as Secretary of Defense as having roughly 400 EMT left following a Soviet first strike. As the policy developed, each leg of the strategic triad had the 400 EMT eventually built into it. This figure was arbitrarily arrived at as the amount necessary to inflict "grievous harm" on Soviet society and thus threaten its existence. The basic principle it operated under was mutual assured destruction.

[2]Crisis stability is where neither side has incentive to escalate a crisis situation, i.e., avoid escalating regional conflict to global.

[3]This argument served primarily to justify the deployment of the Safeguard ABM system to counter a potential Chinese ICBM attack.

were the dual capable aircraft, systems capable of striking the Soviet Union from bases in Europe. The Soviets wanted these forces counted in the U.S. strategic ceiling while naturally refusing to include their own forces. The Soviets also argued that French and British nuclear forces be included, something the respective governments vehemently opposed. To Europeans, the FBS elements constitute a visible, tangible symbol of the U.S. nuclear guarantee to NATO. Removal or partial withdrawal of these elements would lead to de-coupling the American nuclear guarantee.

As far as the U.S. was concerned, the lack of European advocacy in the SALT process was a blessing in disguise. Consultations with our NATO allies increasingly took on the form of sharing information between interested parties rather than mutual discussions amongst affected partners [Ref. 41].

A final note on the acceptance of SALT by the Europeans. In an almost converse line of reasoning, little attention was addressed to the credibility of the U.S. guarantee based on the operative assumptions it had negotiated under (i.e., mutual vulnerability). Instead, strategic stability was stressed. In particular, the British and French forces came to be seen as more credible, by their governments, with the signing of the ABM treaty (part of the SALT I accords).

C. IMPACT OF SALT--EFFECT ON SOVIET THEATER FORCES

> To put 'disarmament' in the [Socialist] program is tantamount to making the general declaration, 'We are opposed to the use of arms.' There is as little Marxism here as there would be if we were to say: We are opposed to violence.
>
> --V.I. Lenin

As mentioned, the Soviets had built and deployed substantial numbers of the SS-4 MRBM and SS-5 IRBM. By the mid-late 1960's the Soviets became concerned over the growing obsolescence of these weapons (nearing their first decade of deployment) and their vulnerability. In the case of the latter, it wasn't until about 1964 that the SS-4/-5 force had begun to be deployed in hardened silos. Previous to that they had been in semi-hardened sites, much as the early *Atlas* ICBM's had been in the U.S. Development of replacements, the SS-X-14 and SS-X-15 IRBM's, was well underway. These were two-stage, liquid fuel missiles based on the aborted SS-13 ICBM. Both employed mobility to ensure survivability. However, neither of these proved successful and only a limited deployment of the SS-14 was made, this to the Far East theater .

In light of these failures, the SS-11 ICBM was modified to a *VRBM* (Variable Range Ballistic Missile) and pressed into service as a form of "gap-filler" in a limited deployment [Ref. 42]. Joining the SS-11 later in this role was the SS-19 ICBM. By 1982-83 approximately 120 SS-11's and 60 SS-19's were reported deployed at Derazhnya and Pervomaysk, two former SS-4 and SS-5 fields in the western regions of the Soviet Union [Ref. 43].

In addition to the land based missiles, SLBM's were available (Figure 3). The first Soviet SLBM was the SS-N-4, a 650 km missile with an IOC of 1959-60. It was soon replaced by the longer range SS-N-5 (1,400 km) in 1964. The SS-N-5 is able to be launched while submerged and carries a warhead estimated to be in the 800 KT - 1 MT range [Ref. 44]. Deployed in the *Golf* II and *Hotel* II class SSBN's in the Baltic or North Atlantic, the SS-N-5 supplements Soviet theater nuclear forces. Although the SS-N-6 MOD 1 was available in 1968 on the *Yankee* class SSBN's, it is probable they were intended more for the U.S. homeland and carried a secondary theater role. Along with the SLBM's, the Soviets had a land attack cruise missile with the SS-N-3c (450+ km; similar to the *Regulus* II missile envisioned for the U.S. Navy in the late 1950's). This version had an IOC of 1960 and was deployed on the *Whiskey* Mod, *Juliett*, and *Echo* II SSGN's [Ref. 45].

Finally, Soviet Long Range Aviation (*Dal'nyaya Aviatsiya*), Frontal Aviation (*Frontova Aviatsiya*) and Naval Aviation (*Aviatsiya Voyenno-Morskogo Flota*) all had nuclear capable aircraft ranging from the *Bear* B/C armed with the AS-3 *Kangaroo* (370 km; 1+ MT), to *Badger* and *Blinder* medium range bombers, and a host of tactical aircraft such as the Su-7 *Fitter* and MiG-21 *Fishbed*.

The 1972 Interim Agreement (SALT I) concentrated on strategic launchers. Excluded from consideration were the independent

nuclear forces of France and Britain, and American and Soviet theater forces (so-called "grey area" systems). The Soviets accordingly viewed the Interim Agreement as not inhibiting the deployment of some 300+ SS-11 VRBM's as it was only a temporary freeze on existing numbers of launchers (i.e., silos).

As the SALT process moved forward, there were agreements that directly impinged on the SS-11 (and later SS-19) VRBM deployments. In the agreement reached at Vladivostok between President Ford and Secretary Brezhnev, the U.S. and the Soviet Union agreed to an aggregate number or "ceiling" on strategic delivery vehicles (SDV's), which included ICBM's and SLBM's [Ref. 46]. This agreement formed he basis for SALT II. Once again though, grey area systems were not covered although concern was broached on the U.S. side about the *Backfire* bomber--in a non-theater but strategic sense (i.e., threat to the U.S.).

Nevertheless, these agreements still had a direct impact on Soviet theater nuclear missile forces. The SS-11's along with the SS-N-4's and SS-N-5's were now included in the aggregate totals (as were the *Bear*'s , but their theater role was secondary to begin with). Some solution was required to maintain theater nuclear force levels. These forces were required even in the face of the reduced numbers of U.S. medium and long range theater systems since Soviet doctrine was essentially the same as in the early 1960's insofar as the role envisioned for nuclear weapons in theater conflict was concerned.

A solution appeared in much the same manner that the SS-15 and SS-14 IRBM's had evolved from the SS-13 ICBM. The SS-16 was another attempt at a land-mobile ICBM that ran into problems with its first stage and was eventually prohibited under SALT. A shorter range version was being developed at the same time using the upper two stages and incorporating a 3 MIRV capability. The result was a reliable, land mob: . IRBM, the SS-2Ø.

VII. DEVELOPMENTS AFTER SALT

The frightful swamp that constitutes theater nuclear weapons in Europe today can in large part be laid to loopholes and inadequacies arising from SALT. In particular, SALT I limited only launchers and therefore channeled the arms race into MIRV'd warheads and theater nuclear forces. The parties to SALT agreed to a "non-circumvention" clause whereby they would not try an end around run and target the other sides' strategic forces with non-limited theater forces. This is one of the charges leveled by the Soviets against the *Pershing* II and GLCM deployment, and occasionally in an indirect manner by the U.S. against the *Backfire* and SS-20.

A. *BACKFIRE*'S AND SS-20'S

Coincident with the arrival of the SS-20 was that of the Tu-22M *Backfire*. The *Backfire* is an outgrowth of the Tu-22 *Blinder* [Ref. 47] and marked its first flight in 1969. The source of great controversy during the SALT II negotiations, the *Backfire* was deemed a "peripheral" system (i.e., not a strategic threat to the U.S. without long-range cruise missiles--cold comfort to the European members of NATO). The *Backfire* marked a qualitative and eventually a quantitative increase in Soviet TNF capabilities. This characteristic, qualitative and quantitative force upgrades, is indicative of Soviet actions during the period following SALT I and continues through the present day. The

Backfire fits in this category by virtue of its range (2600 km in a hi-lo-hi combat profile), Mach 2+ dash speed, and obvious nuclear payload capability [Ref. 48]. This represents substantial gains over the *Badger* and the newer but less reliable *Blinder* medium range bombers. More important is the increased sophistication evident in the electronics suite. The *Backfire* is the first Soviet bomber without a glazed nose for the bombardier, indicative of a substantial improvement in attack radar and all-weather attack capability. It also incorporates substantial improvements in electronic countermeasures (ECM) over its predecessors. While the U.S. Navy correctly emphasizes the anti-ship capabilities of this aircraft (armed with 2 AS-4 or AS-6 ASM's), the theater role of the *Backfire* should not be overlooked in both its nuclear and conventional role (12,000 kg worth of weapons may be carried internally).

The SS-20 represents yet another qualitative and quantitative upgrade. It carries (in one of three mods) either three 150 KT MIRV's or one 1.5 MT RV, with a CEP of 200-400 meters. Maximum range is 5,000 km[1]. The predecessors to the SS-20, the SS-4 and SS-5 were single warhead weapons with megaton range warheads, and CEP's of 2,300 meters and 1,100 meters respectively. Even the SS-11 with a MRV capability (3 x 100-300 KT MRV's) has a CEP of 1,100 meters. The accuracy of the MIRV'd SS-20 in combination

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[1]While others use 4,000 km, the IISS and DoD list it at 5,000 km.

with its range and mobility allows it to be deployed well within Soviet territory, outside of the range of most of NATO's theater nuclear forces with the possible exception of the *Poseidon*'s allocated to SACEUR, and still be employed as a first strike weapon (Figure 4).

Like the *Backfire*, the SS-2Ø stands as a monument to the rechanneling of the arms race by the SALT process into theater nuclear weapons (as well as MIRV's). However the decision to develop and deploy the SS-2Ø did not stem exclusively from arms control rationale. There is genuine military utility in the SS-2Ø as opposed to that found in less the flexible SS-4/SS-5 MR/IRBM force.

The capabilities of the SS-2Ø lend themselves considerably to the concept of strategic maneuver (*strategicheskiy manevr*)[1]. Traditionally, strategic maneuver was carried out by massed concentrations of armed troops and artillery. With the enhanced mobility of the SS-2Ø, originally sought in the SS-X-14 and SS-X-15, Soviet planners are able to maximize their available assets in the strategic maneuver, while MIRV capability reduces coordination and C^3 problems.

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[1] *Strategicheskiy Manevr*: The aggregate of the Supreme Command's measures implemented in the course of an armed conflict by regrouping forces and facilities and reinforcing friendly strategic groupings, by their occupying an advantageous position with respect to the enemy, by redirecting nuclear strikes and shock groupings to secure the rapid and complete destruction of major enemy groupings and achieve a significant strategic success.

In relation to the first point, dependence on those portions of the ICBM force (viz., SS-11's and SS-19's) for "strategic" theater operations is also correspondingly reduced. This again increases the options available to Soviet planners. Use of SS-11's in a theater role might trigger a response from the U.S. ICBM force as the NCA may believe a preemptive or "first strike" on U.S. territory might be underway. Additionally, utilization of these VRBM's in a theater role would reduce the overall Soviet ICBM force by about 10%. According to Meyer [Ref. 49], this prospect in combination with their uncertainties (e.g., system performance) might have led to strong incentives not to launch Soviet TNF until the last clear chance to avoid doing so had passed. Accordingly, the introduction of the SS-20 may now have reduced or altogether eliminated these concerns.

The yield of the SS-20 warheads (in the MIRV'd configuration, which most analysts hold makes up the majority of forces deployed against Europe) demonstrates that reduction of collateral damage to key industries and friendly troop formations has gained greater importance in Soviet military planning. The three 150 KT warheads of the SS-20 have only 50% of the yield of the SS-11's three 300 KT MRV's (and an improvement of 550% in accuracy), and only 15% of the SS-4/SS-5 force while improving accuracies on the order of 550-1,150%. A useful illustration might be served by substituting SS-20's for SS-11's and LRA bombers in the theater

that it appeared to be a joint proposal put forward on the personal initiative of the two negotiators, Paul Nitze for the U.S. and Yuli Kvitsinsky for the Soviet Union. It is also different in that it came to light just prior to the collapse of the INF talks and that afterwards, the views of both negotiators appeared in separate editions of the *New York Times* in January 1984 [Ref. 55].

The formula for the "walk in the woods" proposal consisted of an offer by both sides to reduce each side's long range INF missiles by 572 warheads, and a suggestion that the Soviets would not insist on compensation for French and British missiles at the INF talks in Geneva, but would seek to include them in other negotiating forums [Ref. 56]. The effect of this would be no U.S. deployment and a reduction of over 1/2 of the assumed total of 368 SS-20's deployed both in Europe and Asia.

An interesting and almost byzantine aspect to this affair is just who proposed it and how it came to be. According to Kvitsinsky, Nitze forwarded the idea in an informal setting in July 1982, and was told in no uncertain terms that it would either be severly amended or rejected altogether [Ref. 56]. Nitze [Ref. 57] stated in response that first, the two of them attempted to work up a package of reciprocal concessions that would hopefully resolve the major issues. Nitze mentions that Kvitsinsky showed him a document from his (Kvitsinsky's) government rejecting the principles upon which the walk in the

Union reduced the number of its warheads on land-based long range INF missiles to an equal level on a global basis. This was met with relief by our NATO allies who were having to deal with growing public pressure at home from domestic "peace" groups, in particular by Britain and Germany.

In September the U.S. modified its position even more by stating it would not seek to match the combined Soviet INF force levels (in Europe and Asia) with U.S. deployments in Europe. Additionally, the number of *Pershing* II's deployed could be reduced below the 108 previously agreed to by NATO. Heretofore, the number of *Pershing*'s were fixed at 108[1], and the GLCM component of the modernization program had remained fluid up to the 572 aggregate ceiling agreed to. Another area of concern to the Soviets and previously excluded from immediate consideration revolved around that of limits on aircraft. The final U.S. proposal was made in November 1983. This proposal was for a global 420 warhead (or 140 missile) limit which included European and Asian missiles, for the Soviet Union.

B. THE "WALK IN THE WOODS"

The so-called "walk in the woods" proposal is unique among the U.S. and Soviet positions put forth at Geneva. Unique in

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[1] This was the number of the older *Pershing* 1A's that were to be replaced. By holding to this number NATO hoped to demonstrate to the Soviets that this was merely a modernization effort and not an attempt to gain a margin of strategic superiority over Soviet TNF. This did not include the conventionally armed *Pershing* 1A's maintained by the *Luftwaffe*.

agreement. Complicating the matter was of course the fact that 1980 was an election year and the incumbent was unseated. Following the transition period inherent with any change of administrations in Washington, the Reagan Administration offered its first proposal for consideration at the INF talks.

The first Reagan initiative was the so-called "zero-zero" proposal. Under this scheme, the U.S. would forgo the planned deployment of the 572 *Pershing* II's and GLCM's in exchange for a Soviet commitment to dismantle over 500 SS-4, SS-5, and SS-20 missiles (a total of over 1,000 warheads) targeted against Western Europe and Asia. Asia was included because of the SS-20's mobility and consequent redeployment capability of Asian based SS-20's. The Reagan Administration's rationale behind this proposal centered on its desire to send a signal to the Soviets that the U.S. was committed to eliminating an entire class of potentially dangerous and destabilizing weapons.

Criticisms soon came from both NATO allies and the Soviets that the Reagan proposal was not serious and that the Soviets would be forced to give up weapons already deployed for U.S. promises to drop deployment of weapons not even in production. In March 1983, after three rounds of negotiations and mounting criticisms at home and abroad, President Reagan modified his position and announced the U.S. was willing to discuss an interim agreement in which the US. would substantially reduce the number of *Pershing* II's and GLCM's to be deployed, provided the Soviet

IX. IMPLEMENTING THE "TWO-TRACK" DECISION

> Under the present state of affairs, the Soviet intermediate-range missiles in the European zone are merely a counter-balance to the intermediate range nuclear systems of the NATO countries in that zone. They are not aimed against the West German armed forces. But if American missiles are deployed on West German soil, the situation will change. The military threat for West Germany will be multiplied many times over. Relations between our countries will also inevitably suffer certain complications. *As for the Germans in the FRG and GDR, they... would have to look at one another through thick palisades of missiles* [emphasis added].
>
> -- Yu. V. Andropov
> July 1983

The quote above indicates the seriousness with which the Soviets viewed the impending *Pershing* and GLCM deployments by mid-1983. It is also indicative of their growing frustration over the absence of any gains from their efforts to thwart the deployment either through the vehicle of the INF talks or "public diplomacy." This chapter examines the INF proposals of the U.S. and the Soviets from the first session in November 1981 until the Soviet walkout in November 1983.

A. "ZERO-ZERO" AND OTHER U.S. PROPOSALS

Although the two-track decision was made in late 1979, the U.S. did not begin earnest proposals until almost two years later when round one of the INF talks opened in November 1981. This was initially due to U.S. preoccupation with the Iranian hostage situation, Soviet "fraternal assistance" in Afgahnistan, and attendant problems in the Senate ratification of the SALT II

dominated by activists from outside of the political process. This tendency and apparent Communist ties serves to hamper what little effectiveness this minority party may have in the *Bundestag*.

What characterizes the difference between this movement and the *Kampf dem Atomtod* of over two decades ago is the emergence of two elements never before simultaneously present in postwar German-U.S. relations. These are German uneasiness with American society as a model to be emulated (stemming in part from the Vietnam war) and questions on the course of American security policy. U.S. doctrinal shifts from assured destruction to damage limitation, or war fighting with emphasis on limited nuclear war, caused many Europeans to be troubled with U.S. policy. This latter factor was aggravated when members of the Reagan Administration talked in public of fighting and winning a "limited" nuclear war in Europe. A near decade of *detente* also softened European perceptions of the Soviet threat. All this has lead the peace movement to seek a "third path" between the superpowers.

form of PD-59, and has continued under the Reagan Administration as NSDD 13. As regards theater nuclear forces, NSDD 13 and its predecessors require the Joint Strategic Planning Staff (JSTPS) to integrate all nuclear forces, from theater-tactical up to strategic, enabling the NCA to exercise controlled response options--so-called "limited nuclear options" (LNO). In Soviet eyes, deployment of the *Pershing*'s and GLCM's represented not a NATO answer to the SS-20 deployment, but an attempt by the U.S. to gain a qualitative margin in the strategic balance over the Soviets.

The Soviets weren't the only ones who perceived a threat in the LRTNF modernization issue. Many citizens and special interest groups were concerned about the effect this deployment would have on drawing the world (i.e., West Europe) into nuclear war between the superpowers. In particular, the anti-nuclear movement on the Continent experienced a rebirth. Yet it was different from the movement of the late-1950's, especially in West Germany. In Germany the movement finds political representation through the Green Party. The Green Party was organized in the 1970's as one of a plethora of single-issue parties. choosing as its *cause celebre* the environment. The Greens later turned their interests to nuclear arms and disarmament when East-West relations deteriorated in the early 1980's. It has gained support from elements within both the Protestant Church and the SPD, but it still continues to be

The background to this decision bears many of the hallmarks that distinguished the neutron bomb debate, with some exceptions. The West Germans were even more insistent that other alliance members bear some of the basing responsibilities along with Germany. This differed from the case of the neutron bomb where the delivery systems were fairly short ranged and mandated forward deployment. With ranges of 1,800 km for the *Pershing* II and 2,500 km for the GLCM (Figures 6a and 6b), basing outside of Germany in the case of the latter became tactically feasible and politically imperative.

Like the neutron bomb though, the LRTNF modernization program engendered intense debate on the continent, and whipped Soviet wrath to new highs. While it is understandable that any modernization of NATO nuclear forces would not be welcomed by the Soviets, the source of the Soviet's wrath stemmed from their espoused position that the strategic balance of forces would be upset with the deployment of these particular weapons. In this case, the concept of a balance of forces goes beyond the typical perception of a numerical balance of equality. It becomes more of a blend of differing systems whose aggregate advantages and disadvantages balance those of the opponent.

During the period 1974-80, U.S. strategic doctrine went through a series of transformations yielding plans centered on the concept of damage limitation. The genesis of this period lay in the "Schlessinger shift" and NSDM 242 during the Ford Administration. When Carter came to office, it resurfaced in the

B. THE "TWO-TRACK DECISION"

The fact the neutron bomb was not deployed[1] did not faze the Soviets. SS-20 and *Backfire* deployments continued unabated. In spite of the debate engendered in Europe and the U.S. over the neutron bomb, public opinion polls[2] showed a clear majority believing the Soviets held a lead over the West in power and would substantially widen the margin over the next five years.

Under these conditions, NATO's Nuclear Planning Group[3] pledged in April 1979 to seek support from NATO governments and the public for upgrading nuclear forces in Western Europe. In August the Carter Administration announced its decision to begin development and production of 572 *Pershing* II's and GLCM's (108 *Pershing* II's and 464 GLCM's). Following this, defense and foreign ministers of NATO (minus France) ratified the agreement on 12 December 1979 to begin installing the 572 missiles in 1983 if there was no progress at the proposed intermediate nuclear force (INF) talks. This was the so-called "Two-Track" decision.

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[1] The French subsequently built ERW's of their own. For a while the U.S. continued development of the W82 enhanced radiation warhead for the 155 mm gun. However, legislation introduced by Senator Nunn in 1983 put a hold on further work, leaving the project in Phase 3 (Full Scale Development).

[2] See Appendix D.

[3] The Nuclear Planning Group (NPG) is composed of the defense ministers of Britain, Canada, Italy, West Germany, the Netherlands, Norway, Turkey, and the U.S.

the SS-2Ø. Schmidt for his part was receptive to the idea, but stressed that options on the neutron bomb be kept open. As ultimately concluded following alliance consultations during the winter of 1977-78, a three point proposal emerged in a form similar to the November 1977 letter to Schmidt. Briefly, the points were as follows:

1) The U.S. would decide to produce the weapon;

2) An offer to forego deployment would be made if the Soviets would forego deployment of the SS-2Ø, and;

3) The alliance would announce its intent to deploy the neutron bomb in two years if arms control negotiations with the Soviets were unsuccessful.

A meeting of the North Atlantic Council was set for 28 March 1978 to consider the final proposal, and according to Brzezinski [Ref. 54] it appeared compromise was near.

Yet on March 27, Carter announced his decision against deployment, a decision reached primarily on moral grounds inspite of the support given it by Brzezinski, Brown and others on his staff[1]. All told, this debacle sealed the animosity between Schmidt and Carter insofar as other bilateral and alliance issues were concerned, and set the tone for the growing LRTNF modernization debate.

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[1] In an aside to Hodding Carter later, Brzezinski noted the decision against the neutron bomb would "be the worst Presidential decision of the first fourteen months." [Brzezinski, p. 3Ø5].

President Carter was increasingly ambivalent about the weapon as well. Writing in his memoirs, former National Security Advisor Zbigniew Brzezinski noted the concerns of Carter that:

> ... he did not wish the world to think of him as an ogre and we agreed that we would press the Europeans to show greater interest in having the [neutron] bomb and therefore willingness to absorb some of the political flak, or we would use European disinterest as a basis for a negative decision [Ref. 53].

As debate mounted on both sides of the Atlantic, the Americans insisted that without European willingness to have the weapon, it would not justify the political or economic costs of production. Under Schmidt, the West Germans (for once again it was they who would bear the burden for deployment sites) insisted that deployment could not be a mere bilateral pact between themselves and the U.S. Rather, he argued it must be the result of a collective alliance decision. The other major member of the alliance, the British, were notably cool in their ardor towards the weapon. In the meantime, a virulent debate was growing in the public sector both on the Continent and in the U.S. over the bomb that "kills people but not buildings." That the Soviets were having a propaganda field day over what was seen as the quintissential capitalist weapon goes without saying.

In October 1977, Schmidt made a speech emphasizing the threat to the "Euro-strategic" balance posed by the SS-20 and criticized SALT II for not addressing this matter. Following this, the U.S. suggested to Schmidt that the neutron bomb be linked to arms control. Specifically, the West would forego deployment of the neutron bomb for similar guarantees from the Soviets on

nuclear forces as part of the FY 80 Department of Defense appropriations authorization process [Ref. 52].

Candidates for the modernization program were in various stages of design and development, funded for the most part on shoe-string budgets. Among the more promising systems were the enhanced radiation weapon, or "neutron bomb"[1], a ground-launched version of SAC's ALCM, and a longer range version of the *Pershing* 1A with a unique terminal guidance system promising accuracy measurable in tens of meters rather than hundreds. Development was also well underway for an earth penetrator warhead for the *Pershing* that would allow it to go as much as 30-40 meters deep, putting hardened C^3 facilities at risk.

A. THE NEUTRON BOMB DEBACLE

The neutron bomb was the first system considered for TNF modernization based on its stage in development. The story of the neutron bomb is indicative of European and American attitudes towards nuclear weapons in NATO. Once again, Americans were focusing on defense, specifically the "quick fix" made available by the neutron bomb. The Europeans and in particular, the West Germans wanted the U.S. to commit itself to development while deferring on the issue of deployment.

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[1]The ERW is a thermonuclear device that maximizes the biological lethality of high energy neutrons produced by the fusion of deuterium and tritium, and seeks to minimize blast and thermal damage. The lethal radius of a 1 KT neutron bomb is 700 meters, twice that of fission weapons with equivalent yields and equal to that of weapons with ten times the yield.

VIII. BEDLAM REVISITED: NATO TNF MODERNIZATION EFFORTS

While the buildup in Soviet theater nuclear forces progressed during the 1970's, NATO's TNF received marginal upgrading, confined mostly to improving safeguards in warhead arming. With the exception of the *Lance* SRBM (125 km), there were no significantly new systems deployed. Following in the pattern set the previous decade, a number of systems were unilaterally retired[1]. Conventional forces fared worse in the wake of defense budget cuts by alliance members stemming from welfare state budgets, high inflation, and stagnating economies. Morale ebbed as well in the wake of the Vietnam inspired paralysis. As a result, a certain asymmetry was introduced and grew between NATO's declaratory policy of flexible response and its capabilities to credibly carry out this policy in the face of the burgeoning Soviet TNF modernization program.

By 1977 Chancellor Helmut Schmidt openly expressed his concern with the deployment of the SS-20 and Backfire systems and his dissatisfaction with NATO's lack of response. Concern on the other side of the Atlantic followed in 1978 with the House and Senate Armed Services Committees of the U.S. Congress holding hearings on the modernization of U.S./NATO long range theater

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[1]Among these were the *Bullpup* B (1976) and *Walleye* (1979) ASM's, *Corporal* (1967), *Davy Crockett* (1971) [Photo 5], *Honest John* (1974), and *Sargeant* (1977) SSM's and *Falcon* (1972) AAM.

launch detection, keeping the defenders from employing effective counter-measures.

The air force have received substantial upgrades with the introduction of the Su-24 Fencer (all-weather, low altitude deep strike aircraft, similar to the F-111), the MiG-29 Fulcrum, Su-27 Flanker, and MiG-31 Foxhound. Additionally, Soviet ground-, sea-, and air-launched versions of the U.S. cruise missiles are entering the operational test phase and can be expected to be deployed within a year [Ref. 51], and Soviet artillery has become nuclear capable along much the same lines though not to the same extent as NATO forces.

B. SUMMARY

It is plainly seen that during this period, the Soviet theater nuclear forces buildup was hardly met with self-restraint. If anything, the restraints of SALT I and later SALT II actually channeled increased effort into theater nuclear weapons. The two prime examples cited were the *Backfire*, a weapon system with a clear potential strategic mission but one that was explicitly excluded from consideration under SALT II. The other was the SS-20, the outgrowth of a banned weapon, the SS-16, and warhead technology (MIRV's) allowed under the provisions of SALT I. The fact that the U.S.had unilaterally removed a significant amount of medium and long range theater systems by the end of the 1960's did nothing to slow this process.

strategic role to strike 50 key NATO hardened targets[1]. In doing so, residual fallout is reduced by 90% (although the FRG still comes out on the short end of the stick by suffering initial fallout over some 15-40% of its territory) [Ref. 50]. Finally, the increased survivability of the SS-20 stemming from its mobility and long range decreases the likelihood that Soviet decision makers will be faced with a "use-it-or-lose-it" situation as their NATO counterparts are.

The SS-20 and *Backfire* were not the only improvements of theater nuclear forces undertaken by the Soviets during the past decade. Across the full breadth of theater forces confronting NATO this upgrade has been marked by both quantitative and qualitative improvements. The SS-21, SS-22, and SS-23 SRBM's are replacing the *FROG-7*, SS-12, and SS-1b/c *Scud* A/B respectively, while nearly doubling the ranges of the systems they are replacing. It is one of the contentions of this author that excessive attention to the SS-20 threat has been to the exclusion of the threat posed by these new systems. As an example, SS-22's based at a theoretical site in the center of East Germany have sufficient range to cover every one of the *Pershing* II sites in West Germany, and all but the Comiso (Sicily) based GLCM's (Figure 5). Flight time of an SS-22 to these sites would be on the order of 2-5 minutes, giving virtually no warning time after

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[1]For an illustration of the effects of an attack along similar lines, see Appendix E, especially E-7 and E-8.

woods proposal was made. He then notes [Ref. 58] that on November 12, 1983 Kvitsinsky said if Washington proposed equal reductions in Europe by 572 on both sides, Moscow would accept the proposal [Ref 59]. Since then, Kvitsinsky has imputed this proposal to Nitze. The proposal became moot as both governments rejected it even though it was never put forth in formal settings (i.e., at the conference table).

C. SOVIET PROPOSALS

Throughout the INF arms control process, the Soviet position has been marked by three elements. The first and ultimately sole goal of Soviet foreign policy during the period in question, centered on thwarting any deployment of the *Pershing* II or GLCM. While this was the dominant theme under Andropov and continues to be under Chernenko, the roots of this policy may be traced to Brezhnev. Secondly, the Soviets consistently sought to include the national strategic systems of Britain and France into the INF forum despite the protests of these two states that their forces were the sole province of their respective nations and leaders. Finally, the Soviets continually sought to impose limits on dual-capable aircraft (DCA). By far though, their chief concern remained in stopping any deployment of U.S. missiles in Europe.

Soviet proposals were characteristically a conglomeration of older ones repackaged and reproposed, within the framework of the previously described areas. Typical of this was the Soviet position through December 1982 that the USSR and NATO should each

limit the total number of intermediate range nuclear missiles and aircraft in and near Europe to 300, and that no U.S. missiles be allowed in that figure -- only its aircraft. In a speech marking the 60th anniversary of the founding of the USSR, Andropov modified this stand somewhat by retaining the framework, but specified a sub-limit on missiles for each side, with the Soviets retaining only as many missiles as were in the combined French and British forces, about 162 by Moscow's count [Ref. 60]. Again, Andropov refused to agree to any U.S. missile deployment. By linking the proposal to French and British force levels Andropov made the possibility of agreement very unlikely, if not altogether impossible.

In May 1983, Andropov announced a willingness to agree to equality in intermediate range nuclear forces in Europe with regard to both delivery vehicles and warheads. It would appear this proposal addressed Western concerns over the MIRV capability of the SS-20 and hence, its greater destructive potential. In actuality it provided a hedge for Soviet force planners against projected French and British SLBM force modernization programs.

The proposal in August 1983 to liquidate rather than redeploy east any European SS-20's removed under an agreement was primarily to ease Chinese, Japanese and NATO concerns in this regard. The proposal directly contradicted remarks made by Foreign Minister Gromyko at an April press conference to the effect that previous American demands along these lines made any agreement impossible.

Yet another modification came in late October--timed to coincide with the parliamentary debates and anti-nuclear demonstrations in Europe, particularly in West Germany, and to benefit from negative reaction to the U.S. operation in Grenada. In doing so, the Soviets hoped to capitalize on European perceptions of American intransigence in the face of Soviet flexibility. This ploy did not work as the Soviets were still suffering bad press over the KAL 007 atrocity and revision of French and German attitudes over the Grenada operation. By now it was apparent to the Soviets that the deployment would take place.

D. PROSPECTS FOR AGREEMENT AT THE INF TALKS

In examining the INF talks from the first session until the final round in November 1983, the question of whether either side sincerely desired to reach an accord on limiting theater nuclear weapons must be addressed. On the part of the U.S. there certainly were strong lobbies on both sides of the aisle. The enormous bureaucratic apparatus of the Arms Control and Disarmament Agency (ACDA) and the State Department on one side were pushing for some agreement. On the other side were those who felt that some form of deployment must take place to signify that NATO could still agree to and carry out major policy decisions. In addition, a major debate was growing in the strategic arms control arena over not only technical issues of

verification, but over Soviet compliance with arms control agreements. This was having collateral effects on the U.S. INF position as well.

Yet as negotiations progressed, the U.S. demonstrated increasing flexibility in its position as its focus broadened from that of intermediate range missiles to a wider vision of theater nuclear forces. Indicative of this was first the willingness to reconsider *Pershing* II deployment levels and later an indication of willingness to consider limits on aircraft, both of which were major Soviet concerns.

The Soviet approach to the INF talks centered on stopping the deployment of the U.S. missiles. Anything beyond that would be a benefit, but the primary goal was stopping the deployment. To this end the Soviets adopted several rather extraordinary methods not found in their actions in other arms control forums. Andropov appeared to personally take charge of the Soviet position, making it (the December 21 proposal) his first major foreign policy initiative [Ref. 61]. As the year progressed, he made major, public pronouncements on the INF issue every month except for January, June, and December. Another extraordinary measure was that Soviet proposals were anything but secretive, with many being put forward outside of the talks at Geneva.

The actions listed above were probably carried out in belief that they (the Soviets) might be able to stir up enough pressure in Western Europe to stop the deployment. Overt plays to the peace movement and attempts at influencing the West German

elections in March 1983 were along these lines. The quote at the beginning of this chapter is illustrative of Soviet attempts to increase pressure on the Germans to oppose deployment rather than concentrating on reaching some accord with the U.S.

However, the Soviets overestimated their ability in this field as their attempts to influence the election backfired. Helmut Kohl and the Christian Democrats remained in power while the Soviets lost what credibility they may have had in the wake of the KAL tragedy. The Soviets were also less than optimistic about their chances of reaching an agreement with the Reagan Administration. Pessimism abounded in statements in the press and by the Soviet leadership about any chance for successful negotiations with Reagan.

That there were Soviet efforts at reaching some kind of agreement at the INF talks cannot be denied. The primary efforts though of the Soviets were not present at Geneva. Outside of a very brief period following Brezhnev's death when the Soviet-U.S. atmosphere was not as hostile, indications are that the Soviets came to hold a fatalisitc belief that the deployment would proceed inspite of their extracurricular activities and as such, progressively boxed themselves into a tighter situation with their growing insistence on no deployment.

E. DEPLOYMENT AND SOVIET RESPONSE

Andropov flatly stated in the first week of November 1983 that if the deployment went forward, the Soviets would walk out

of the Geneva talks. The first components of the GLCM's arrived one day ahead of schedule at Greenham Common Royal Air Force Base on 14 November 1983, ostensibly to avoid planned public demonstrations. On Tuesday, November 22, the West German Parliament approved installation of the *Pershing* II's which in turn began to arrive on the 23rd. That same day the Soviets delegation walked out of the Geneva talks without setting a renewal date.

Soviet actions since then have consisted of leaving the START and MBFR talks. In addition, they appear to be making good on Brezhnev's threat to "put the U.S. in an analogous position" if deployment went ahead. Soviet cruise missile carrying *Echo* II SSGN's have taken up patrols at various times off the U.S., and *Delta* class SSBN's have extended their patrols into old *Yankee* patrol grounds in the Atlantic, ensuring shorter flight times to continental U.S. targets. Additional SRBM's (e.g., SS-22) are being deployed in East Europe as part of a planned modernization program. However, these deployments are being cited in the Soviet press (and parroted in the West) as stemming solely from the U.S. deployment. The Soviets had asserted that the missiles must be removed as a precondition prior to the reopening of any INF negotiations. It would appear though that the proposal by the U.S. to engage in "umbrella talks" covering strategic nuclear, space and intermediate range weapons may have offered the Soviets a way out of their self imposed exile. Even this

rests on thin ice as the Soviet foreign minister, Andrei Gromyko, asserted in a recent domestic television interview that the talks might be in jeopardy if the GLCM and *Pershing* II deployments continue. Additionally, the Soviets are insisting that agreement be reached in all three rounds and of course, that the French and British systems be included (nothing about counting Chinese systems though). Thus, along with the research effort of the Strategic Defense Initiative (SDI), INF once again stands to complicate and possibly derail arms control efforts. In the meantime the U.S. missiles have just topped 100 while SS-20's have grown past 400.

X. SUMMARY AND TRANSITION

A. U.S. THEATER NUCLEAR DOCTRINE IN EUROPE--SUMMARY

U.S. nuclear doctrine in Europe has been driven foremost over the years by economic and technological factors, with sound strategic doctrine ranking at best a poor third. This fact is epitomized by the transition in force structure that took place during the 1950's. As previously shown, the years prior to Eisenhower yielded no clear doctrine with respect to nuclear weapons. The Truman Administration had hoped that the atomic bomb would be sufficient to compel the Soviets into proper behavior.

However, it soon became evident that even during the short period of the American monopoly, the Soviets would not be deterred from fomenting trouble in Europe. The clearest indication of this was the Berlin blockade in 1948. There are those that might say the prospect of atomic devastation kept the Red Army from sweeping over Western Europe, but in point of fact, in the years immediately following the war, the Red Army was in no condition to do this. Although at war's end there were some 11.36 million under arms in the Soviet armed forces, by 1948 this had dropped to 2.87 million [Ref. 62]. These forces were fairly well occupied with the consolidation of East Europe into Soviet satellites. Granted a mobilization would have pumped these numbers back up, but even in that event, the atomic force

structure was such that it would not have had a significant impact against either invading forces or the strategic rear (by themselves).

With Eisenhower, the convergence of economic considerations and technological advances made possible the wholesale expansion of nuclear (atomic and thermonuclear) weapons in Europe. On the economics side, Eisenhower was determined to cut back on ground force commitments on the part of the U.S.; an interesting decision in light of the 1952 Lisbon conference agreement whereby NATO settled on 96 divisions as being sufficient to quell a Soviet led attack. Increasing dependence was placed on airborne strategic nuclear deterrence to the detriment of conventional forces, especially ground troops and the Navy. To make this policy credible (*viz.* the threat to use nuclear forces to counter any type of aggression), the Administration deliberately set out to blur the distinction between nuclear and conventional forces. Eisenhower stated in an address before the United Nations General Assembly in December 1953 that "[a]tomic weapons have virtually achieved conventional status within our armed forces."[Ref. 63] There was an apparent low regard for the potentially devastating effects on Europe should nuclear weapons be used on a widespread basis. This was confirmed by NATO Supreme Allied Commander General Alfred M. Gruenther's statement in 1954 that:

> ...simply because atomic bombs do create casualties--and heavy casualties against women and children--is no reason why we should become sentimental over...what weapons must be used. The chore is to make war itself impossible. [Ref. 64]

The ultimate expression of this ambiguity came again from Eisenhower in 1955 when he said that he didn't see why atomic weapons shouldn't be used "just exactly as you would use a bullet or anything else."[Ref. 65] The qualifying statement that these weapons would be used where strict military targets could be identified and struck, provided small consolation for Europeans, given the yield and collateral effects of these weapons and the inaccuracies of their delivery systems. It might be noted this was the same year that the infamous Operation "Carte Blanche" and its large scale use of atomic weapons took place. In sum, by allowing economic costs and technological advances dictate strategy, greater reliance on nuclear weapons came to pass which in turn constituted greater risks.

The policy of flexible response sought to reduce this increased level of risk by rebuilding conventional forces and *strategic* nuclear forces (especially those that would be based in the U.S.). The strategy of flexible response made good sense in an alliance system where major partners (i.e., the U.S. and Britain, France and Germany) are separated by an ocean. This was especially the case between the main nuclear partner and its allies where the latter is the principle theater of operations, and where the potential aggressor's forces stand to inflict grave damage on all alliance members. Flexible response then allows NATO to deter aggression by responding at whatever level the enemy would choose to fight--so called "escalation dominance."

A key factor in this scheme is the ability to convince the enemy that one is able to convincingly terminate combat at any level, from small scale conventional combat up to that of global, strategic nuclear war.

Critics of flexible response focus, in part, on questions regarding force planning. Such questions include what targets should be struck with nuclear weapons, when and with what weapons should those targets be struck with, etc.[Ref. 66] As related to nuclear force structure in NATO, flexible response became less viable as the years passed due to a number of factors. Among these were the growing vulnerability of the land-based arms of the U.S. strategic nuclear deterrent (i.e., the heavy bombers and *Minuteman* ICBM's) in the face of the massive Soviet strategic arms build up that started in the mid-1960's, and an asymmetry introduced with the theater nuclear arms build up by the Soviets in the 1970's following unilateral withdrawal by the U.S. of a substantial portion of its theater-strategic forces by 1968. Compounding the situation is a conventional balance of forces that has historically been numerically in favor of the Soviets and an inflexible conventional strategy that requires the emplacement of conventional forces as far forward as possible to try and stop the expected flood of Soviet forces from pouring across the borders.

B. SOVIET THEATER NUCLEAR DOCTRINE IN EUROPE--SUMMARY

In studied contrast to NATO's theater nuclear doctrine, which some have charitably labeled *ad hoc*, has been that of the Soviets--a process that has been both evolutionary and revolutionary over the past forty years. At first the Soviets tended to downplay the significance of nuclear weapons, a result of their natural desire not to call attention to the perceived lead of the U.S., questions over the actual utility of nuclear weapons in war and the lack of an effective means of delivery. Variations of this theme continued well into the 1950's until the synthesis of thermonuclear weapons and long range missiles combined with Khrushchev's desire to break the stranglehold of Stalin on military thought laid the groundwork for the "revolution in military affairs" that began in 1962. In a curious way, Khrushchev may also have been motivated by some of the same beliefs as Eisenhower by seeking to reduce the dependence on and costs of maintaining conventional forces (i.e., Soviet Ground Forces and all but missile armed submarines in the Soviet Navy) by increasing reliance on nuclear armed, long range missiles. Indeed, these weapons were now deemed to be decisive weapons in a future war and the Strategic Rocket Force (which would control all land based missiles with ranges greater than 500 km) was elevated to the position of the supreme service, one formerly held by the ground forces.

Here too technology was a factor although for the Soviets it was more a limitation than one of force enhancement. Limiting in

the sense that while a credible ICBM force eluded the Soviets until the second and third generation ICBM's came on line, the MR/IRBM force came to be a credible and effective force in its own right. It is an axiom of Soviet force planning that once a weapon system proves itself effective it is aggressively retained and not likely to be given up--unlike the case of U.S. medium range forces in Europe. The result of this process, the ongoing improvement of the MR/IRBM force as well as that of the other theater nuclear forces, has been gradual quantitative *and* qualitative improvements, best exemplified by the development and deployment of the SS-20 IRBM (Figure 7).

By the mid-late 1970's when the Soviets realized that no immediate response from NATO was forth coming on the SS-20 deployments, it became apparent that there was an opportunity to drive a wedge between the U.S. and West European members of NATO. This would come about by putting the credibility of the U.S. nuclear deterrent in question. One of the ways this came about lay in the change in the strategic balance of forces. Unlike the situation of the early 1960's when the U.S. enjoyed not only a significant margin of strategic superiority but one of *invulnerability* as well, the situation of the late 1970's was one of perceived strategic parity (some assert a growing Soviet superiority). The result--stalemate on the strategic nuclear level.

For theater forces, the Soviets clearly had (and still have) the upper hand both in terms of numbers of warheads and delivery vehicles as well as total EMT. The exception to this were tactical nuclear weapons, especially those found with nuclear artillery and ADM's. However, these are subject to degradation due to age as many have been in the stockpile for almost 25 years, and have begun to be withdrawn as part of the Montebello Decision of 27 October 1983[1]. Again exacberating the situation was the conventional force imbalance such that NATO became faced with the dilemma of being forced to resort to early, if not first use of tactical nuclear weapons to counter Soviet conventional force advantages and yet in doing so, risked devastation from Soviet counter-nuclear attacks with elements of their theater-strategic forces.

In fact, current Soviet doctrine calls for preemptive attacks (preferably with conventional or unconventional forces, e.g., *Spetznaz*) on storage sites and bases of NATO's theater nuclear weapons. Aiding Soviet planners is the fact these sites are among the most heavily guarded, well lit and presumably well known to enemy forces, in Europe. They are also few in number

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[1] The Montebello Decision of 27 October 1983 was a decision taken by the NATO Nuclear Planning Group to withdraw an additional 1,400 nuclear warheads from Europe over the next "several years." When added to previous warheads withdrawn since 1979 a total of over 2,400 will be withdrawn. Most of these are obsolete warheads, or those that were part of weapons systems being replaced in favor of conventionally armed ones. An example of the latter case is the replacement of *Nike Hercules* AAM batteries in favor of the Patriot and I-Hawk AAM's.

AD-A156 144 BETWEEN SCYLLA AND CHARYBDIS: THEATER NUCLEAR FORCES IN EUROPE(U) NAVAL POSTGRADUATE SCHOOL MONTEREY CA C W DOSSEL MAR 85 2/4

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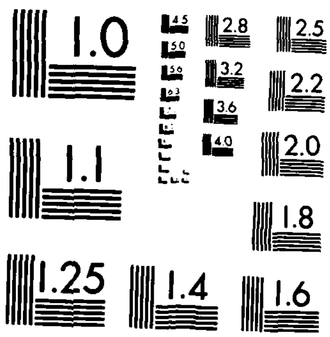

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

with many in forward areas of NATO territory, simplifying pre-strike targeting.

The superiority enjoyed by the Soviets with their theater-strategic forces in Europe prompted them to move into the political arena with the onslaught of the "peace offensive." Aided by U.S. proclivity to shoot itself in the foot in a diplomatic sense (one need only recall the neutron bomb debacle), the Soviets seemed on the verge of making a successful attempt to use the well meaning but somewhat naive peace movements in West Europe to their political and military advantage. The saving grace for the Alliance came with the 1979 two track decision and the elections of conservative governments in the U.S., Britain and West Germany, and surprisingly, a socialist government in France. As the deployment date approached, Soviet intentions became clearer through their heavy-handed machinations, not the least of which was their attempt at manipulating the West German elections in March 1983.

Today the deployment is proceeding, but the question of whether security for the Alliance has been assured still lingers. To a large degree this rests on perceptions of what path NATO will take for Alliance security in the future. The implications of this question are addressed beginning with the next chapter which assesses the current conventional and nuclear balance in Europe. For now, the Alliance is in the position of a convict who has received a stay of execution; but one that is at best temporary.

PART TWO:

ANALYSIS OF THE CURRENT SITUATION

XI. PRESENT BALANCE IN EUROPE-I

A. NATO AND WTO CONVENTIONAL FORCES

The analysis of the current military balance in Europe serves as a point of departure for part two. A few items are worthy of note before proceeding. One is that given the unclassified nature of this work, the figures used are likewise drawn from unclassified sources. However, given the nature of Western society those mentioned for NATO forces are probably closer to actual figures than those given for WTO forces. It might serve well to remember that one of the major points of contention at the Mutual and Balanced Force Reduction Talks is the very basic question of counting both sides' forces and agreeing to a common data base.

Another item is the very reason for addressing conventional force balances and doctrine in a body of work reserved for discussion of theater nuclear weapon issues. It serves the purpose here of showing the present inseperability of conventional forces and conflict, and built in escalation to the use of tactical nuclear weapons under present doctrine. The end purpose is to explore this link to see if emphasis can once again be placed on the deterrent aspect of nuclear weapons and conventional forces. Reinforcement of the deterrent aspect of conventional forces is assured by a conventional warfighting ability that guarantees a WTO defeat in the event of incursion

into NATO territory and of the former, by ensuring the credibility of certain theater nuclear weapons.

1. <u>NATO Forces</u>

Since the inception of NATO in 1949, it has numerically remained below first Soviet, and later WTO forces. It has been shown that even when NATO decided on a major expansion of its conventional forces (e.g., the Lisbon Conference decision), the Alliance failed to follow through and fell short of matching Soviet or WTO forces.

Today is no exception as NATO conventional forces quantitatively remain below those of the WTO. Instead the Alliance has come to rely on nuclear weapons and technology to offset these imbalances. The idea is that superior Western technology gives NATO military personnel a decisive qualitative edge over WTO quantitative superiority. This line of reasoning would give, for example, one F-15 pilot the ability to engage and destroy say, three opposing MiG-23's.

This analysis revolves around the Central front, and as such will primarily look at ground and land based air forces. This does not mean though, that naval forces have a small role to play in NATO strategy. Indeed, in certain respects, they play the pivotal role. However, when considering the central front, naval forces do not play a direct conventional part, short of contributing some carrier-based or maritime aircraft or elements of amphibious forces in support of land based aircraft and ground forces. These forces will more likely be heavily engaged on

NATO's northern tier (Norway), or southern flank (Mediterranean).

Table 1 below shows the disposition of divisions in Northern Europe (including those in Norway) as of the end of 1983. It is broken down by:

(a) divisions in Europe and manned in peacetime;

(b) divisions manned and available for immediate reinforcement; and

(c) extra divisions available for reserves.

"Tnk" includes tank and armored divisions; "Mech" includes mechanized, motorized and motor rifle; "Other" includes airborne, airportable, mountain, amphibious and light infantries.

Table 1

NATO Divisions, N. Europe, non-U.S.

	Tank	Mech	Other
(a)	18.0	13.33	6.67
(b)	0.0	1.67	2.67
(c)	0.67	16.0	11.0
Totals	18.67	31.0	20.33

Source: IISS, *The Military Balance, 1983-84*.

Adding U.S. and Southern European divisions (which include French and Canadian forces in Europe but not Spanish) yields Table 2. This latter table is obviously the best case for NATO, especially when considering the central front. Table 3 gives the breakdown for major equipment types. These types are main battle tanks (MBT's), artillery and multiple rocket launchers (Atly/MRL), surface-surface missile (SSM)

Table 2

NATO Divisions, Total.

	Tank	Mech	Other
(a)	25.33	25.0	39.67
(b)	1.67	4.33	5.0
(c)	4.0	19.67	23.33
Totals	31.0	49.0	68.0

Source: IISS, *The Military Balance, 1983-84.*

launchers, anti-tank guns (ATG), anti-tank guided weapon (ATGW) launchers (e.g., TOW), anti-aircraft guns (AA) and surface-air missile launchers (SAM). The first column, (a), is for N. Europe, non-U.S., the second, (b) for the U.S., and the third (c) is the total number, including S. Europe for the "best case" picture.

Table 3

NATO Ground Force Equipment

		(a)	(b)	(c)
1.	MBT's	8,097	5,000	20,722
2.	Atly/MRL	4,228	562	8,996
3.	SSM	96	144	300
4.	ATG	850	0	946
5.	ATGW	880	700	2,080
6.	AA	4,355	120	6,062
7.	SAM	1,571	180	2,103

Source: IISS, *The Military Balance, 1983-84.*

Table 4 lists land based aircraft which include bombers, attack (including fighter-bombers), fighters, interceptors, reconnaissance (including electronic counter-measures (ECM) and airborne early warning (AEW)), and armed helicopters. The differences between bombers and attack aircraft are found in range and/or payload while that between fighters and interceptors centers mainly on range, with interceptors reserved more for point defense purposes (e.g., RAF *Lightning*'s) and fighters able to range more widely and establish air superiority over the battle front (e.g., USAF F-15's). The first column, (a), is for N. Europe, non-U.S. assets, the second, (b), for U.S. aircraft and the third, (c), lists the totals.

Table 4

NATO Land Based Aircraft (Fixed and Rotary Wing)

		(a)	(b)	(c)
1.	Bombers	34	Ø	34
2.	Attack	1,12Ø	498	2,186
3.	Fighters	116	96	212
4.	Intercpt.	416	Ø	647
5.	Reccon.	19Ø	66	354
6.	Arm. Hel.	8Ø5	33Ø	1,195

Source: IISS, *The Military Balance, 1983-84.*

As may be seen from the tables above, the NATO forces are not inconsiderable and those contributed by European NATO members are fairly sizeable in all categories, constituting the majority in some. Soviet and other WTO forces will next be detailed.

2. WTO Forces

Because of certain geographical advantages that accrue to the Soviet Union, it is difficult to accurately assess the balance of conventional forces in Europe. The scheme adopted by the IISS in this case will be utilized here. Namely, those Soviet forces in the European Military Districts in the Western and Southern Theaters, excluding the Turkestan MD, of the Soviet Union will be counted. Additionally, territorial defense units (e.g., *Voyska-PVO*) and paramilitary units (e.g., KGB border patrol) are not counted.

Tables 5 and 6 list WTO ground force divisions in the same manner as Tables 1 and 2 did for NATO:

Table 5

WTO Divisions, non-Soviet

	Tank	Mech	Other
(a)	15.0	25.0	2.0
(b)	1.67	0.0	0.0
(c)	0.0	13.0	0.0
Totals	16.67	38.0	2.0

Source: IISS, *The Military Balance, 1983-84*.

Table 6

WTO Divisions, Total

	Tank	Mech	Other
(a)	31.0	52.0	2.0
(b)	9.67	12.0	5.0
(c)	16.0	43.0	0.0
Totals	56.67	107.0	7.0

Source: IISS, *The Military Balance, 1983-84.*

Table 7 shows equipment totals in the same manner as Table 3 did for NATO. The first column shows non-Soviet WTO forces, the second is Soviet forces in place, and the third shows the totals.

Table 7

WTO Ground Force Equipment

		(a)	(b)	(c)
1.	MBT's	12,490	13,000	25,490
2.	Arty/MRL	6,830	5,000	11,830
3.	SSM	335	272	607
4.	ATG	1,250	678	1,928
5.	ATGW	1,500	287	1,787
6.	AA	2,900	1,086	3,986
7.	SAM	1,400	1,751	3,151

Source: IISS, *The Military Balance, 1983-84.*

Table 8 shows the geographic advantages of the Soviet Union. The first column is carried over from the totals above (column c), the second shows the the additional equipment presumed to accompany Soviet reinforcement divisions in Europe,

and the third gives the sum of the first two columns--a "worst case" condition for NATO.

Table 8

Ground Force Equipment, WTO Totals

		(a)	(b)	(c)
1.	MBT's	25,490	+19,200	44,690
2.	Arty/MRL	11,830	+10,000	21,830
3.	SSM	607	+730	1,337
4.	ATG	1,928	+1,746	3,674
5.	ATGW	1,787	+385	2,172
6.	AA	3,986	+2,900	6,886
7.	SAM	3,151	+3,142	6,293

Source: IISS, *The Military Balance, 1983-84*.

Table 9 shows the disposition of WTO land-based aircraft. The first column, (a), lists non-Soviet aircraft, the second, (b), lists only Soviet aircraft, and the third, (c), lists the totals.

Table 9

WTO Land Based Aircraft (Fixed and Rotary Wing)

		(a)	(b)	(c)
1.	Bombers	0	455	455
2.	Attack	568	1,100	1,668
3.	Fighters	0	700	700
4.	Intercpt.	1,506	2,880	4,386
5.	Reccon.	164	400	564
6.	Arm. Hel.	86	700	786

Source: IISS, *The Military Balance, 1983-84*.

As was the case with ground forces equipment, the same is true for WTO aircraft and Soviet reinforcement capabilities. The advantages of this are once again seen in Table 10.

Table 10

WTO Land Based Aircraft (Fixed and Rotary Wing)

		(a)	(b)	(c)
1.	Bombers	455	+0	455
2.	Attack	1,668	+900	2,568
3.	Fighters	700	+1,000	1,700
4.	Intercpt.	4,386	+0	4,386
5.	Reccon.	564	+400	964
6.	Arm. Hel.	786	+0	786

Source: IISS, *The Military Balance, 1983-84*.

Again, it is plain to see that this too is a "worst case" situation confronting NATO.

3. <u>NATO-WTO Conventional Force Comparisons</u>

Before starting to make the comparisons, some distinctions should be drawn. First, divisions on the two sides are unequal both in strengths and equipment assigned. The figures that are shown for comparison purposes constitute the "best case" for NATO. That is, they include forces in S. Europe (Italy, Greece and Turkey) and presume full equipment availability on both sides (e.g., full mission capable (FMC) aircraft). Two comparisons in each case will be made, one versus WTO forces in place, the other the "worst case" situation which incorporates Soviet reinforcements.

The first comparison, Table 11, is that of divisions. The first column shows NATO forces, the second WTO forces and the third presents a ratio (rounded to the nearest tenth) between the two.

Table 11

NATO:WTO Force Comparisons (Divisions)

	NATO	WTO	Ratio	Adv.
Mech.				
1. Tank	25.3	31.0	1:1.4	+WTO
2. Inf.	25.0	52.0	1:2.1	+WTO
Subtotal	50.3	83.0	1:1.7	+WTO
3. Other	68.0	2.0	34:1.0	+NATO
Total	118.3	85.0	1.4:1.0	+NATO

Source: IISS, *he Military Balance, 1983-84.*

Table 12 adjusts the figures found in Table 11 to reflect the "worst case" scenario facing NATO with the addition of WTO reserves (especially those drawn from the Soviets).

Table 12

NATO:WTO Force Comparisons (Divisions)

	NATO	WTO	Ratio	Adv.
Mech.				
1. Tank	25.3	56.67	1:2.2	+WTO
2. Inf.	25.0	107.0	1:4.3	+WTO
Subtotal	50.3	163.67	1:3.3	+WTO
3. Other	68.0	7.0	9.7:1.0	+NATO
Total	118.3	170.67	1:1.4	+WTO

Source: IISS, *The Military Balance, 1983-84.*

The silos themselves have been placed no closer than three kilometers [Ref. 72] which requires more warheads to be allocated for a "kill." Table 22 summarizes the land-based missile force.

Table 22

NATO Land Based IRBM's

System	Number Deplyd.	Yield (MT)	Range (km)	CEP (nm)	CMP
Pershing II	36	.05	1800	.02	531.22
GLCM	64	.05	2500	.02	531.22
SSBS S-3	18	1.0	3500	.40 (est)	6.25

Source: Various

b. Theater-Strategic: Sea Based Missiles

With the dis-establishment of a large portion of the land based missile and air breathing nuclear forces in the late 1960's and early 1970's, the sea based leg (*Figure 9*) grew in importance. Today it maintains a significant portion of the total theater-strategic EMT deployed (some 153 MT worth or 233 MT including the French), but a much smaller portion of the total CMP.

In assessing the sea based balance of forces, it was assumed that one *Poseidon* carrying SSBN is allocated to SACEUR. This yields 16 *Poseidon* C3 SLBM's with an average force loading of 10 warheads per missile [Ref. 73]. These consist of the W68/Mk-3 MIRV with a yield of 50 KT apiece. The CMP is not considerable, with 22.47 per missile resulting from low yields

site at RAF Greenham Common and Comiso, others are set for RAF Molesworth; Woensdrecht, the Netherlands[1]; Florennes, Belgium; and Wueschein, FRG.

The first 9 *Pershing* II missiles constitute the first of four planned firing batteries in a planned three battalion deployment (one brigade) located at Neu Ulm and Schwabisch Gmuend, FRG. The full 108 are expected to be deployed by the end of 1986.

The only other missiles officially considered as "strategic" are 18 silo based French IRBM's located on the Plateau d'Albion in Haute Province. The SSBS S-3 IRBM's are deployed in these silos. It has a 3,500 km range (Figure 8) and a 1 MT warhead that includes decoys and penetration aids[2] [Ref. 71]. These silos have been hardened to withstand an overpressure of 200 psi[3]. The S-3 employs the "hot-launch"[4] technique and as such, it is believed that there are no reloads with the silos.

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[1]The Netherlands base has been put on temporary hold by the Dutch government. Deployment will proceed if they (the Dutch) feel the Soviets have deployed any more SS-20's. As of January 1985, there appeared to be no change in the Dutch position. Belgium will begin deployment at the end of March 1985.

[2]**Penetration aids:** devices employed by offensive weapons systems to increase probability of penetrating enemy defenses (e.g., chaff).

[3]For reference, *Minuteman* III silos are hardened to ca. 2,000 psi.

[4]**Hot Launch:** the missile is fired from the silo with no provisions to protect the inside of the silo from thermal or blast damage, making it a "single-shot" launcher. The SS-18 and MX employ cold launch techniques.

On the issue of nuclear capable aircraft, those listed as theater - strategic platforms (e.g., F-111 E/F and *Mirage* IV) are aircraft reserved for the QRA role, whose primary duty is nuclear deterrence. The other aircraft (e.g., F-16's, *Tornado*'s, etc.) are included under the theater-tactical section since they have both a nuclear and conventional mission, and in the initial days of conflict will probably be heavily engaged in air superiority/close air support missions of a conventional nature. It should be remembered though that the combination of range, payload, and basing makes these aircraft a potentially formidable nuclear strike force for the Soviets to deal with.

a. Theater-Strategic: Land Based Missiles

As mentioned, the first units of the *Pershing* II and the GLCM were deployed in November 1983. These consisted of 32 GLCM's and 9 *Pershing* II's. When deployed, a GLCM "flight" consists of 4 transporter-erector-launchers (TEL's), 16 missiles (4 per TEL), two launch control centers (LCC's), 16 support vehicles and 69 personnel [Ref. 69]. A total of 565 missiles are planned for production, of which 464 will be deployed in Europe, barring any change in arms control negotiations. By March 1984 one GLCM flight was established at Comiso, Sicily. Plans are to have 166 deployed in Europe by the end of FY 1985, and the full 464 by the end of FY 1987 [Ref. 70]. In addition to the initial

Table 21

Pershing 1A vs. *Pershing* II

		Pershing 1A	*Pershing* II
1.	IOC	1962	1983
2.	Length	34.5 ft.	34.5 ft.
3.	Weight at launch	10,273 lb.	16,400 lb.
4.	Guidance	inertial	inertial/ terminal radar
5.	Range	740 km	1,800 km
6.	CEP	0.2 nm (450 m)	.02 nm (36m)
7.	Warhead	1 x W50 nuclear	1 x W85 nuclear
8.	Yield	60,200,400 KT	5-50 KT
9.	Yield (EMT)	0.54 MT	0.14 MT
10.	CMP	11.33	531.22
11.	Launchers	800 {108}	384 {108}
12.	Number per Launcher	1	1

{ } -- denotes # in Europe, U.S. only

Source: *Nuclear Weapons Data Book, Vol. 1.*

There was no clearly defined doctrine that dictated this progression. Rather it chiefly came about as technology provided breakthroughs at increasingly lower levels in such fields as micro-miniaturization and digital controls. Even the advent of PD-59 and NSDD-13 with their respective contemplation of waging limited nuclear war, came about after technology had made abundantly clear what present and future capabilities would be. Other elements of the force structure (most notably British SLBM's) were due for modernization in the near future. Finally, there was the previously noted political and military requirement to counter the Soviet theater nuclear build up. The immediate results of NATO's reply are listed below.

To get a better picture of what these and other numbers mean, a mathematical model was developed covering two scenarios with two variations within each scenario. Briefly, both situations call for preemptive Soviet strikes on elements of NATO's theater-strategic nuclear forces with a given number of SS-20's. This is in keeping with current Soviet doctrine which calls for preemption and does not exclude the use of nuclear weapons. One variation in each situation came with the addition of French national strategic forces. The other concerns the year such that one variation counts forces as of 31 December 1984, the other with forces projected to December 1987. The assumptions, formulae, lists of forces, etc. are found in Appendix E. Later conclusions as to the effects of nuclear war in Europe are drawn from the model as well.

1. NATO Nuclear Forces

NATO's nuclear forces over the past few years have begun to tread the same path U.S. strategic nuclear systems started down in the early 1970's. That is towards MIRV'd SLBM's, higher accuracys and lower yields. A prime example of this process is the difference between the *Pershing* 1A and the *Pershing* II. Table 21 compares the two. As may be readily seen, yield was traded off in favor of an improvement in accuracy of some 1,250%. CMP correspondingly jumped to a value almost 4.5 times that of the original. This came about as the equation for CMP is particularly sensitive to changes in CEP ($CMP = EMT/CEP^2$).

XII. THE PRESENT BALANCE IN EUROPE--II

A. NATO AND WTO NUCLEAR FORCES

Continuing the previous chapter's theme, this one examines the nuclear balance in Europe. In many ways this is a somewhat easier balance to calculate, and in others, more difficult. As an example, until the advent of the small, long range cruise missile and land-mobile IRBM, theater nuclear delivery systems were a bit easier to keep track of with the various "national technical means" (NTM) at the disposal of the major powers.

In assessing the nuclear balance of power in Europe, a methodology was employed that provided some common basis for comparison since each nuclear system on both sides has comparative disadvantages and advantages. This basis for comparison is "counter military potential" or CMP. It has been used in calculating the counterforce capabilities of the American and Soviet strategic nuclear forces. CMP is a function of the equivalent megatonage (EMT)[1] of a weapon system divided by the square of its circular error probable (CEP)[2].

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[1] **EMT:** a measure used to compare the destructive potential of differing combinations of nuclear warhead yield against relatively "soft" countervalue targets.

[2] **CEP:** A measure of the delivery accuracy of a weapon system. It is the radius of a circle around a target of such size that a weapon aimed at it has a 50% probability of falling within the circle. CEP's listed here are in nautical miles (nm).

late 1960's/early 1970's. Within the past two years, the Soviets have begun to deploy a new generation of tactical land based aircraft, represented by the MiG-29 *Fulcrum* and the Su-27 *Flanker*. Indications are that these aircraft are very similar to the F-16 and F-15 respectively in terms of airframe and weapons system performance. The same may be seen across the broad spectrum of weapons, ranging from anti-tank and anti-aircraft missiles able to be launched by a single man to aircraft and submarines.

The "dark side" of the technology "trump card" (and this holds for both NATO and WTO forces although it is more pronounced in the case of the West) lies in the mounting cost and complexities of these systems. Cost has been a factor resulting from inflation and a tendency to "gold plate" weapons systems, that is, continuing to add mission requirements/capabilities to the system as it is developed to make it able to do all things. This in turn complicates the system, aggravating maintenance requirements and spare parts supply. The final result is a more capable weapon--when it works, is available and not "down" for lack of spares or maintenance.

As the technology "trump card" fades in significance with the determined Soviet effort to catch up, the focus shifts back to nuclear weapons as the second potential "trump" available to stop a WTO onslaught. This issue is addressed in the next chapter.

Improved training[1] increased this to 12:1 with the same aircraft just four years later [Ref. 68].

However, the Soviets have been striving over the past fifteen years to overcome this technology gap. To show this, the same comparison will be made between the McDonnell Douglas F-15C *Eagle* and the MiG-23 *Flogger G*.

Table 20

F-15C vs. MiG-23 Comparison

		F-15C	MiG-23	Adv.
1.	Mission	Air Super.	Air Super.	---
2.	Wt. (max)	25,401 kg	18,500 kg	MiG-23
3.	Max. Spd. @ 36,000 ft	Mach 2.5+	Mach 2.2	F-15C
4.	Combat Radius	4,631 km	930 km	F-15C
5.	Climb rate	40,000 fpm	n/a	---
6.	All Weather ?	Yes	Yes	---
7.	Max. Weapon load	12,700	7,200	F-15C
8.	Thrust-to-Wt. ratio	1:1	1:1	---
9.	Wing loading	low	low	---
10.	Max. rng. of AAM's	62 mi (AIM-7F)	20 mi (AA-7)	F-15C

Source: Gunston, *Encyclopedia of World Airpower*.

As may be seen in comparing the two tables, the West still maintains a lead, but it is a smaller margin. Additionally, both these aircraft had their design impetus in the

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[1] This chiefly came from the establishment of the Fighter Weapons School (Top Gun) at NAS Miramar by the U.S. Navy. The Air Force soon followed with their own version.

was the MiG-21MF *Fishbed*, which also began deliveries during 1967. Table 19 gives a run down on the capabilities of these aircraft with respect to the air superiority mission.

Table 19

F-4E vs. MiG-21MF Comparison

		F-4E	MiG-21MF	Adv.
1.	Mission	Multi-role	Multi-role	---
2.	Wt. (max)	24,430 kg	10,000 kg	MiG-21
3.	Max. Spd. @ 36,000 ft	Mach 2.17	Mach 2.0	F-4E
4.	Combat Radius	840 km	500 km	F-4E
5.	Climb rate	49,800 fpm	25,900 fpm	F-4E
6.	All Weather ?	Yes	No	F-4E
7.	Max. Weapon load	10,000	3,800	F-4E
8.	Thrust: Wt. ratio	1:0.7	1:0.8	MiG-21
9.	Wing loading	moderate	low	MiG-21
10.	Max. rng. of AAM's	20 mi (AIM-7E)	4 mi (Atoll)	F-4E

Source: Gunston, *Encyclopedia of World Airpower*.

Clearly the advantage went to the F-4E which had a longer range, longer engagement range, greater weapons load capability, etc. Yet even given these advantages, U.S. aircrew had many a nasty surprise during engagements with MiG-21's over North Vietnam when loss ratios marginally favored USN fighters (including F-8's and F-4's) by barely 2:1 in 1968 [Ref 67].

maintain that adequate defenses may be maintained through the exclusive use of anti-armor weapons (e.g., TOW, Hellfire, etc.). Therefore, the cases listed below follow this scheme:

Case 1: NATO (Defense: no tanks) vs. WTO (Offense)

Case 2: NATO (Defense: +tanks) vs. WTO (Offense)

Case 3: Same as Case 1 + Soviet reserves

Case 4: Same as Case 2 + Soviet reserves

Offensive forces primarily include tanks, artillery, and anti-tank weapons (guns and PGM's). Defensive forces combine these forces (in consonance with the above listed cases) with helicopters.

Table 18

NATO vs. WTO Forces (Ground Attack)

	NATO	WTO	Ratio	Adv.
1. Case 1	13,217	41,Ø35	1:3.1	+WTO
2. Case 2	33,939	41,Ø35	1:1.2	+WTO
3. Case 3	13,217	72,366	1:5.5	+WTO
4. Case 4	33,939	72,366	1:2.1	+WTO
Total Divisions	9Ø	85	1.1:1	+NATO
Total Divisions, +Reserves	148	17Ø.67	1:1.2	+WTO

Source: IISS, *The Military Balance, 1983-84*.

In the past, some have stressed that superior Western technology significantly makes up for some of these deficits. As an example, consider the case of aircraft (ca. 1968). For NATO the front line aircraft was the McDonnell Douglas F-4E *Phantom*, which began to enter the inventory in 1967. On the other side

mission assignment scheme, but this time with the addition of Soviet reserves.

Table 17

NATO vs. WTO Forces (Air Battle)

		NATO	WTO	Ratio	Adv.
1.	Case 1	9,378	3,994	2.3:1.0	+NATO
2.	Case 2	3,086	12,787	1:4.1	+WTO
3.	Case 3	9,378	6,060	1.5:1.0	+NATO
4.	Case 4	3,086	19,265	1:6.2	+WTO

Source: IISS, *The Military Balance 1983-84*.

Moving to the ground battle, the same sort of comparison will be used. This comparison is less clear cut than that between aircraft for several reasons. For example, an armored assault may be accompanied by mechanized infantry and supported by helicopters, artillery and a variety of anti-armor weapons. Counterposed to this assault may be the same arrangement of forces. Some assumptions are in order before continuing the comparisons for ground forces. The first of these is the role of helicopters. Given their greater vulnerability to ground fire as well as some range/payload tradeoffs and limitations, it is assumed that the defending forces have access to their helicopters whereas the attacking forces would lack immediate support beyond the areas bordering NATO and WTO territory. The key to this of course lies in the ability of the defending forces to maintain air superiority over the battle field. Some who have decried the trend towards more tanks and other armor pieces

Adjusted for Soviet added reserves:

Table 16

NATO:WTO Land Based Aircraft

		NATO	WTO	Ratio	Adv.
1.	Bombers	34	455	1:13.4	+WTO
2.	Attack	2,186	2,568	1:1.2	+WTO
3.	Fighters	212	1,700	1:8.0	+WTO
4.	Interceptors	647	4,386	1:6.8	+WTO
5.	Recce.	354	964	1:2.7	+WTO
6.	Armed Helo.	1,195	786	1.5:1.0	+NATO
	Total	4,628	10,859	1:2.3	+WTO

Source: IISS, *The Military Balance, 1983-84.*

The previous comparisons are useful in some regards, but a more accurate force comparison would be with elements intended for offense versus those for defense. This is the case with the next series of tables. The first will consider the air picture with WTO and NATO forces swapping off on either interdiction/deep strike missions or air defense. The deep strike/interdiction order of battle for this comparison will consist of bombers, attack, fighters and SSM's. Air defense forces include interceptors, fighters, SAM's, and AA guns. The dual capabilities of AEW and ECM aircraft for both sides is recognized by counting them in both the deep strike and air defense missions. The first line assigns the deep strike/interdiction mission to WTO forces, and that of air defense to NATO. The second line reverses the mission assignments. The third and fourth lines follow the same

Table 14

NATO:WTO Force Comparison (Equipment)

		NATO	WTO	Ratio	Adv.
1.	Tanks (MBT)	20,722	[illegible]4,690	1:2.2	+WTO
2.	Arty/MRL	8,996	21,830	1:2.4	+WTO
3.	SSM	144	1,337	1:9.3	+WTO
4.	ATG	946	3,674	1:4.0	+WTO
5.	ATGW	2,080	2,172	1:1.0	Draw
6.	AA	6,062	6,886	1:1.1	+WTO
7.	SAM	2,103	6,293	1:3.0	+WTO

Source: IISS, *The Military Balance, 1983-84.*

Clearly once again the geographic advantages of the Soviet Union show forth. Top be sure, if the conflict were prolonged and NATO was able to bring to bear its productive capabilities as well as mobilizing its reserves, these balances would begin to shift back to a 1:1 basis. The next two tables (15 and 16) compare land based aircraft.

Table 15

NATO:WTO Land Based Aircraft

		NATO	WTO	Ratio	Adv.
1.	Bombers	34	455	1:13.4	+WTO
2.	Attack	2,186	1,668	1:1.3	+NATO
3.	Fighters	212	700	1:3.3	+WTO
4.	Interceptors	647	4,386	1:6.8	+WTO
5.	Recce.	354	564	1:1.6	+WTO
6.	Armed Helo.	1,195	786	1.5:1.0	+NATO
	Total	4,628	8,559	1:1.8	+WTO

Source: IISS, *The Military Balance, 1983-84.*

As may be seen from a comparison of mere numbers, the Soviet backed WTO forces hold noteworthy leads in mechanized divisions in both circumstances, although they are somewhat slimmer in the first comparison. NATO on the other hand holds decisive margins in the "other" category in both conditions. It will be recalled that this category includes airborne divisions, light infantry, etc.

The next comparisons are between levels of ground equipment available, again using the "standing force" and "worst case" situations facing NATO.

Table 13

NATO:WTO Force Comparison (Equipment)

		NATO	WTO	Ratio	Adv.
1.	Tanks (MBT)	20,722	25,490	1:1.2	+WTO
2.	Arty/MRL	8,996	11,830	1:1.3	+WTO
3.	SSM	144	607	1:4.2	+WTO
4.	ATG	946	1,928	1:2.0	+WTO
5.	ATGW	2,080	1,787	1:1.2	Draw
6.	AA	6,062	3,986	1.5:1.0	+NATO
7.	SAM	2,103	3,151	1:1.5	+WTO

Source: IISS, *The Military Balance, 1983-84*.

Table 14 follows and is adjusted for Soviet reinforcements.

and modest accuracies. Combining the small CMP and other factors such as delayed communications serves to ensure that this weapon remains one with a second strike mission. Unlike the land-based systems, deployed SSBN's are assured virtual invulnerability for the near term pending any unforeseen Soviet ASW breakthrough.

The British presently deploy the *Polaris* A-3 SLBM with the *Chevaline* warhead. The *Chevaline* warhead consists of 6 x 200 KT MRV's (as distinguished from MIRV's), improved penetration aids, and incorporates post-boost guidance to improve accuracy [Ref. 74]. The present SSBN force consists of 4 aging hulls of the *Resolution* class. In July 1980 the British government decided to accept an offer by the U.S. to allow the British to subscribe to the new *Trident* I (or C4) SLBM. Over a year later, the Reagan Administration announced its intentions to accelerate the development of the *Trident* II (D5) so as to reach the fleet by 1989. After some agonizing reappraisals, the British Government signed on to the D5 program with plans to build 4 new SSBN's able to carry the D5 with the first to be deployed by 1994-5. The addition of this capability (along with the U.S. deployments) will give a significant CMP[1] capability to the sea based force. For now though it remains a retaliatory force unless used against fairly "soft" targets (i.e., airfields. non-hardened missile sites, etc.). For the model, it was assumed

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[1] The D5 has an 8-10 MIRV warhead (150-600 KT range yield) with a CEP of .07 nm. The calculated CMP for the D5 yields a staggering 140,000 per missile. By way of comparison, the CMP of the entire Minuteman III force armed with the Mk-12A RV is 30,168.

that two boats were on patrol or immediately available (i.e., not in port) under the non-alert scenario.

The French sea based force has characteristics similar to the first *Polaris* SLBM's, i.e., large yields (one MT) to make up for greater inaccuracies. The French SSBN force consists of 5 hulls of *Le Redoutable* class, and is building two "improved" *Redoutable*'s to form the basis of a new class, the lead of which will be *L'Inflexible* slated to enter the fleet in mid-1985. This class, and some units of the older *Redoutable* class are scheduled to be outfitted with the M-4 SLBM which incorporates a MIRV capability. However for the present, the M-2Ø is deployed and incorporates "hardening" for penetrating a limited ABM defense [Ref. 75].

The sea-based legs of NATO's theater-strategic force are by far the most "delicate" diplomatically, for in the case of Britain and France they fall directly under the control of their respective heads of state and are dedicated to "national" ends. This is not to say that the *Poseidon*'s allocate SACEUR are not ultimately controlled by the U.S. President. Rather, more than any other system (save the French IRBM's) the commitment of these systems to NATO is somewhat ambiguous. There is evidence that the British cooperate considerably more with NATO in this regard though. Finally, of all the systems--air breathing, land based missile, etc.--these are the only ones presently covered by

signed and ratified arms control agreements[1]. Table 23 summarizes NATO's sea based nuclear forces.

Table 23

NATO Sea Based Missiles

System	Number Deplyd.	Yield (MT)	Range (km)	CEP (nm)	CMP
1. *Poseidon*	16	(10 X .05)	4600	.25	22.47
2. *Polaris*	64	(6 X .2)	4600	.51	7.99
3. MSBS M-20	80	(1 X 1.0)	3000	.51	3.89

Source: IISS, *The Military Balance 1983-84*.

c. Theater-Strategic: Air Breathing Forces

Aircraft represent over half of the total number of theater-strategic nuclear systems and deliverable CMP. The U.S. maintains 120 F-111 E/F's split between RAF Upper Heyford and Lakenheath in the U.K. These aircraft are on nuclear armed quick reaction alert (QRA) at all times. They are configured to carry the B43, B57, B61, or B83 nuclear bombs with yields ranging from 10 KT up to 1 MT. With an excellent low-level, all weather, high speed penetration profile and avionics suite that allows precise delivery of weapons, these are potent weapons systems that will put a great degree of stress on WTO air defenses.

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[1] This is true even though SALT I has expired and SALT II was not ratified by the U.S. Nevertheless, both the U.S. and the Soviets have agreed to still adhere to the provisions of these agreements.

Additionally, elements of the U.S.A.F.'s Strategic Air Command have deployed on a more or less regular basis out of England since SAC's other bases in Europe and North Africa were closed during the 1960's. These include FB-111's and B-52's, both armed with the Short Range Attack Missile (SRAM) and nuclear bombs. It may be assumed that in the case of the B-52, cruise missile carrier (CMC) configured aircraft might be included, adding to the WTO air defense woes. However, these forces are not counted in the balance as they are not dedicated to NATO (just as CMC configured *Bear* H's and the *Blackjack* are not included in WTO totals).

With the retirement of the last of the *Vulcan* strategic bombers from the RAF, Britain no longer has a long range airborne strike force. At one time there were plans to acquire F-111's for the RAF as well as some consideration to developing a long range cruise missile, but these plans were dropped. Britain still has a considerable number of nuclear capable medium and short range aircraft, but these will be noted in the following section.

For its part, France still has an air breathing force dedicated to the nuclear strike role. However, this consists of 34 aging *Mirage* IVA's (Figure 8, IOC 1963). These will be phased out beginning in 1985 with completion sometime in the 1992-3 time frame in favor of silo based IRBM's. The French *Armee de l'Air* will still have a capability for deep strike missions with the *Mirage 2000* supplementing the remaining IVA's, although these

will not be maintained in the same high alert state. Beginning within the next two to three years, both aircraft will be armed with the AMSP, a 300 km stand-off weapon with a yield of 100-300 KT [Ref. 76].

For the moment, the airbreathing forces represent an important leg of NATO's nuclear deterrent. However, just as manned bombers in the U.S. nuclear triad are becoming increasingly vulnerable[1] in their present basing modes, so too are NATO's long range bombers. This is amply demonstrated in the nuclear exchange model where only 42 F-111's survived a preemptive SS-20 attack on their two main airfields. Moving towards better dispersal of assets may improve their chances of surviving a preemptive attack. Additionally, WTO air defenses are being reinforced with the addition of such "new generation" systems as the MiG-29 *Fulcrum*, MiG-31 *Foxhound*, and Su-27 *Flanker*, all with "look-down, shoot-down"[2] capability, the IL-76 *Mainstay* AEW&C platform, and SA-10 SAM's. Table 24 summarizes NATO's air breathing long range nuclear forces.

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[1] The primary threat faced by the bomber force stems from SLBM's launched from just off the coasts of the U.S. These may have flight times as short as 10 minutes. This will be aggravated as SLBM's with depressed trajectories are developed.

[2] This is the ability to pick targets out of ground clutter (e.g., cruise missiles) engage and destroy them.

Table 24

Long Range Aircraft, NATO (+3200 km range)

System	Number Deploy.	Number of Warheads	Yield (MT)	CEP (nm)	CMP
F-111 E/F	120	2	1(ea.)	0.1	200
Mirage IVA	34	2	.015(ea.)	0.1	15.35

Source: IISS, *The Military Balance, 1983-84.*

d. Theater-Tactical: Missiles and Artillery

During the heyday of the atomic battlefield a substantial portion of the tactical nuclear forces were found in this category. These ranged from the sublime (the *Redstone*) to the ridiculous (*Davy Crockett*)[1]. Today the numbers have been drastically pared back, with the only new system (i.e., not a derivative of an existing system) being the *Lance* (IOC 1972) and *Tomahawk* SLCM (IOC June 1984). There is a certain amount of controversy surrounding the latter which will be discussed below. For land based forces, joining the *Lance* are the *Pershing* 1A and *Honest John* for the U.S. and NATO countries (excluding France). Not to be left alone, France also fields a tactical nuclear battlefield missile, the *Pluton*. The *Pershing* and *Honest John* are relics from as far back as 1954 (for the *Honest John*). These

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[1]The Redstone was directly developed from the V-2 of WW II vintage with a range of almost 370 km and put the first U.S. astronaut into space. At the other end of the spectrum was the Davy Crockett, a .25 KT, 51 lb. rocket of reportedly very short range and not popular with the infantry men assigned to fire it. It was finally withdrawn from the inventory in the early 1970's.

missiles as well as the *Lance* and *Pluton* have a dual nuclear/conventional capability. However, with CEP's ranging from over 1 nm (*Honest John*) to 0.16 nm for the *Pluton*, the use of high explosive conventional warheads could be somewhat ineffectual. It should be pointed out that the *Honest John* is no longer in the active inventory of the U.S. and is maintained by Greece and Turkey. However, the U.S. retains control over the nuclear warheads. Accompanying the age of these weapons systems are attendant problems in reliability[1]. The U.S. has 72 *Pershing* 1A's that are being replaced with the longer range *Pershing* II's. However, West Germany continues to operate 72 *Pershing* 1A's under the aegis of the *Luftwaffe*. The *Lance* is operated by the U.S. as well as Belgium, West Germany, Britain, Italy, and the Netherlands. France deploys 42 *Pluton*'s.

By far the largest number of warheads are those dedicated to nuclear artillery. Most estimates place the number deployed in Europe at close to 5,000 [Ref. 77]. A substantial portion of these also entered the stockpile during the height of the doctrine of the atomic battlefield. Because of this, a significant portion of the number of nuclear warheads being withdrawn from Europe under the Montebello decision consist of nuclear artillery shells. There are two versions of nuclear

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[1]For example, the Honest John must be warmed by electric blankets for a 24-48 hour period prior to use to attain a predetermined temperature for even propellant burn. This procedure along with several other system draw backs combine to reduce the overall reliability of the system.

capable artillery (dependent on caliber) currently in use. These are 155 mm and 8-inch pieces. The warheads used are the W48 (155 mm) with a sub-kiloton yield (~.1 KT), produced during the early-mid 1960's and the W33 (8-inch) with a 2-12 KT yield, produced during the mid-1950's to mid-1960's.

These weapons were to have been replaced by the ERW in Europe, but events have combined to scrub that for the immediate future. Two ERW's have been produced and are stored in the U.S. These are the W70-3[1] for the *Lance* and the W79-1 for 8-inch[2] (203 mm) artillery [Ref. 78]. A third warhead, the W82[3], has had a fitful period of development.

The *Tomahawk* SLCM is a departure from the other missiles by virtue of its range, yield, and accuracy. Essentially a sea based version of the GLCM, the Tomahawk has a 250 KT warhead that when combined with its accuracy of .02 nm yields a devastating CMP of over 1,550. A limited deployment was started with the reactivated battleships *New Jersey* and *Iowa* (later to include the *Missouri* and *Wisconsin*) and the USS *Guitarro* (SSN-637 class). Ultimately these missiles would be

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[1]The W70-3 ERW is a 1 KT weapon utilizing tritium. About 340 warheads for 100 launchers were in NATO were built and are stored in the U.S.

[2]The W79-1 ERW is a 1 KT yield weapon of which 65-70% is fusion utilizing plutonium and tritium. Approximately 120-300 were built and are stored at Seneca Army Depot, NY.

[3]The W82 ERW has a yield of < 2 KT and was intended to replace the W48. Costs have climbed to $3 mill. per warhead, but funding was reinstated in the FY 1985 budget.

deployed in the remainder of the SSN-637 class as well as the SSN-594 and SSN-688 classes, *California, Virginia*, and *Long Beach* class CGN's, *Ticonderoga* CG's, *Spruance* DD's, and *Burke* DDG's. Also unlike the other missiles, the *Tomahawk* can be a most lethal conventional weapon in both an anti-ship and an airfield/second echelon strike (using precision guided submunitions/runway cratering submunitions) roles. There are no external distinguishable characteristics between the nuclear armed and conventional *Tomahawk* though. It is this ambiguity and the potential verification problems it might pose to future arms control agreements that led Congress to cut funding for nuclear armed Tomahawk SLCM's in the FY 1985 budget. However, since some 44 Tomahawks have deployed at various times, these were included in the force balance table. Table 25 summarizes theater-tactical missiles and artillery.

e. Theater-Tactical: Aircraft

As previously noted, aircraft were the first platforms to carry tactical nuclear weapons. Today aircraft carry the majority of deliverable megatonage both for theater-strategic and -tactical purposes. It is a safe assumption that any aircraft in the U.S. inventory capable of carrying weapons is nuclear capable[1]. That mean that its *primary* mission is

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[1]Possible exceptions to this are the A-10 and the F-14, the latter only for lack of a nuclear version of the AIM-54 *Phoenix* AAM.

Table 25

NATO Theater-Tactical Missiles & Artillery

System	Number Deplyd.	Yield (MT)	Rng. (km)	CEP (nm)	CMP
U.S.					
1. *Pershing*	72	0.4	720	.22	11.33
2. *Lance*	36	0.05	125	.21	3.24
3. SLCM	44	0.25	2400	.02	1551.63
4. M-109	252	.002-.0005	18	n.a.	n.a.
5. M-110	200	.002-.0005	21	.09	1.78-0.73
non-U.S.					
1. *Pershing*	72	0.4	720	.22	11.33
2. *Honest John*	54	0.02	40	1.02	0.07
3. *Pluton*	42	0.025	120	.09	3.19
4. *Lance*	56	0.05	125	.21	3.24
5. M-109	252	.002-.0005	18	n.a.	n.a.
6. M-110	200	.002-.0005	21	.09	1.78-0.73

Source: Various.

a nuclear one though. As an example, the F-16 has a range greater than the *Mirage* IVA (3800 km vs. 3200 km) but the majority will be occupied with gaining air superiority and providing ground support. They may be called upon though for nuclear strikes beyond the FEBA.

In addition to land based aircraft, carrier based aircraft (both CTOL and VSTOL) enter the picture. Their capabilities run from close air support (AV-8A *Harrier*, A-7E *Corsair* II) to medium range penetration-interdiction (A-6E *Intruder*, *Super Etendard*). Carrier based aircraft have been a

particularly sharp thorn in the Soviet's side since they first began to be deployed with nuclear weapons over thirty years ago.

Of all the theater nuclear systems, aircraft, particularly short and medium range aircraft, have seen the most efforts towards modernization. Indicative of this is the widespread production and deployment of the F-16, *Tornado*, and *Mirage* F.1. Still there are significant numbers of older nuclear capable aircraft still in the inventory, including the F-4E and *Mirage* IIIE.

The weapons carried by these aircraft are the same as those available to the F-111's (for NATO members excluding France), namely the B28, B43, B57, B61, and B83 nuclear bombs with yields ranging from 5 KT to +1 MT. The lone nuclear AAM still in the inventory is the Genie which is fast approaching retirement. Work is underway at a low level of intensity to build a nuclear version of the AIM-54 *Phoenix*. Table 26 summarizes the tactical nuclear aircraft balance of forces for NATO.

2. WTO Nuclear Forces

The buildup of theater nuclear forces by the Soviet Union has already been amply documented. This buildup continues today inspite of Soviet protestations of a self imposed "moratorium" or statements to that effect. The net result is a substantial Soviet nuclear force margin over NATO forces, one of the largest of which is found in missiles.

Table 26

Tactical Nuclear Capable Aircraft, NATO

System	Number Deploy.	Number of Warheads	Yield (MT)	CEP* (nm)	CMP
U.S.					
1. F-4E	96	2	1 (ea.)	.1	200.00
2. F-16	144	1	1	.05	400.00
3. A-6E	30	2	1 (ea.)	.1	200.00
4. A-7E	72	2	1 (ea.)	.1	200.00
5. F/A-18	24	2	1 (ea.)	.05	800.00
non-U.S.					
1. *Tornado*	80	2	1 (ea.)	.05	800.00
2. F-16	90	1	1	.05	400.00
3. F-4E	142	2	1 (ea.)	.1	200.00
4. *Mirage* IIIE	30	2	.015 (ea.)	.10	12.20
5. *Super Etendard*	36	2	.015 (ea.)	.10	12.20

[*: CEP's estimated]

Source: IISS, *The Military Balance 1983-84*.

a. Theater-Strategic: Land Based Missiles

Soviet military doctrine differs from that of the West in, among other things, including a middle level of classification between strategic and tactical, called *operational tactical*. One of the spinoffs from this is the blurring of what constitutes a "strategic" and a "tactical" missile. Ostensibly, the SS-22 would be considered a "tactical" missile in a Western inventory, yet in Soviet eyes it may fulfill a "strategic" mission. For purposes here though, it will be included with the theater-tactical nuclear systems.

Recent articles [Ref. 79] have quoted Reagan Administration officials and intelligence sources as stating that some 400 SS-20's are now deployed, up from 378, with 1,200 total warheads deployed. One of these articles states the Soviets may be headed toward an eventual 600 missile force that would be teamed with two new GLCM's [Ref. 80]. If the same ratios held for the projected deployment of SS-20's (with 2/3 immediately available to cover all of Europe), this would mean 400 SS-20's would be dedicated to targeting NATO with another 200 deployed against Chinese forces and presumably available to bolster the European SS-20's. This was the scheme followed for the model where it was assumed 267 and 300 of 400 and 450 SS-20's respectively were immediately available. The remainder of the aging SS-4/SS-5 IRBM force is deployed in the western region of the Soviet Union and may be expected to be retired[1] within the next few years.

Of the two GLCM versions, the one that is in final operational tests and soon to be deployed, the SS-CX-4, is virtually identical to the U.S. GLCM in terms of size, range, and presumably guidance. A much larger version [Ref. 81], nearly twice the physical size of the SS-CX-4, is in development and most likely will have a larger warhead, longer range and/or

[1]Dismantling of the weapon and launchers may not immediately follow though, an important point to remember with Soviet weapon system philosophy.

greater speed. Finally, to complicate matters, the Soviets have begun deploying a new ICBM, the SS-25, at established SS-20 sites [Ref. 82]. The SS-25 is a three stage, solid fuel missile with capabilities similar to those of the *Minuteman* ICBM. Unlike *Minuteman* though, it is land mobile. The issue faced here is that this missile provokes troubling comparisons to previous ICBM/IRBM codevelopment (witness the previously mentioned SS-16/SS-20 genealogy) in addition to making future arms control negotiations more complicated. Table 27 summarizes Soviet land based MR/IRBM's.

Table 27

Soviet/WTO Land Based IRBM's

System	Number Deployed	Yield (MT)	Rng. (km)	CEP (nm)	CMP
SS-4	223	1	2000	1.26	0.63
SS-5	16	1	4100	0.60	2.75
SS-20	267 (400)	3 X .15	5000	0.11	70.08
SS-CX-4	devl.	.2	3000	0.04	213.98

(Includes SS-20's deployed in Far East)

Source: Various.

b. Theater-Strategic: Sea Based Missiles

Even in a category that has long been dominated by the West, the Soviets still hold a significant margin here too when matching CMP (870 vs. 1598 not including French SLBM's). This comes about chiefly because of the smaller yields (in spite of greater accuracys) of Western SLBM's. For the model, the SS-N-5 was considered to be exclusively for the European theater,

or declines as a function of age, national will, and vulnerability among other factors. Mere modernization is not always enough to enhance credibility.

The illustration of this idea was one of the purposes behind the theater nuclear exchange model. There remain two standouts in this scenario from a survivability standpoint. One is that as the GLCM reaches more and widespread deployment that in an alert situation they may be able to disperse early enough and without notable detection by the Soviets such that a larger number would survive following a Soviet first strike. Additionally, a larger portion of the Soviet inventory would be needed to gain a higher kill probability and as this level escalates, the collateral damage to non-military targets may become unattractive to Soviet plans for post-attack occupation and exploitation. The other standout is that of the *Tomahawk* SLCM. Discounting arms control complications for the moment, deployed in highly survivable platforms (e.g., SSN's or converted SSBN's) it provides a formidable retaliatory force. Retaliatory since both the SLCM and the GLCM lack one requirement of first strike weapons, namely they are not a time urgent weapon because of their subsonic speed. To a degree it is offset by their small size and low flight profile, but the advent of a new generation of interceptors and SAM's with quick reaction and low altitude engagement capabilities diminishes this advantage.

Clearly the only leg with a major portion of its CMP remaining is the SLBM leg. However, even assuming that the entire French and British SLBM force was allowed to be used to retaliate against the remaining Soviet theater-strategic forces along with the survivors of the remainder of NATO's TNF, it falls well shy of being able to put a substantial dent in the remaining Soviet forces.

Escalation to use of strategic nuclear forces by the U.S. would most certainly garner a reply from the Soviets that would destroy a large portion of the ICBM's and bombers withheld from the initial attack as well as putting U.S. population centers in jeopardy. Additionally, the Soviets aren't likely to distinguish between an SLBM launched in retaliation as one that was at the behest of SACEUR or one as part of a U.S. strategic force response.

Some might argue that this is at best a specious exercise, that the value of nuclear weapons lies only in deterrence and that if they are used then their *raison d'etre* is defeated. Of course there is the other side which argues for application of nuclear weapons as one would any other type of weapon. The relative merits and demerits of these viewpoints and those that lie between are debated in a later chapter.

For now it is important to stress that one of the critical aspects of deterrence is the credibility of the weapons systems charged with that mission. Their credibility increases

Table 39

Post-Attack Analysis #4: Force Levels as of Dec 1987 [+ France]

NATO:				
1.	IRBM's			
a.	Destroyed CMP	210,894		[210,994]
b.	Surviving CMP	92,964		[92,977]
c.	% original surviving	33 %		[30 %]
d.	Number surviving	162 GLCM/ 13 P-II		[2 S-3]
2.	SLBM's			
a.	Destroyed CMP	80		[120]
b.	Surviving CMP	790		[1,060]
c.	% original surviving	88 %		[88 %]
d.	Number surviving	16 *Poseidon*/ 54 *Polaris*		[70 M-20's]
3.	Aircraft			
a.	Destroyed CMP	15,600		[15,938]
b.	Surviving CMP	8,400		[8,584]
c.	% of total surviving	35 %		[35 %]
d.	Number surviving	42 F-111		[12 *Mirage*]
4.	Total Force			
a.	Total CMP (pre-strike)	328,730		[329,675]
b.	Surviving CMP	102,156		[102,624]
c.	% of total surviving	37 %		[37 %]
Soviet/WTO:				
1.	Forces expended <% of respective force>			
a.	IRBM's (SS-20's only)	27	<6>	[46 <10>]
b.	SLBM's	0	<0>	[0 <0>]
c.	Aircraft	0	<0>	[0 <0>]
2.	CMP employed <% of respective force>			
a.	IRBM's	1,892	<6>	[3,224 <10>]
b.	SLBM's	0	<0>	[0 <0>]
c.	Aircraft	0	<0>	[0 <0>]
3.	Totals expended <% of total>			
a.	CMP	1,892	<2>	[3,224 <3>]
b.	Megatonage	12.2		[20.7]
c.	EMT	23		[39]

Source: Appendix E

Table 38

Post-Attack Analysis #3: Force Levels as of Dec 1987 [+ France]

NATO:

1. IRBM's

a.	Destroyed CMP	255,516	[255,616]
b.	Surviving CMP	48,341	[48,353]
c.	% original surviving	16 %	[16 %]
d.	Number surviving	78 GLCM/ 13 P-II	[2 S-3]

2. SLBM's

a.	Destroyed CMP	170	[290]
b.	Surviving CMP	705	[895]
c.	% original surviving	81 %	[76 %]
d.	Number surviving	16 *Poseidon*/ 43 *Polaris*	[49 M-20's]

3. Aircraft

a.	Destroyed CMP	15,600	[15,938]
b.	Surviving CMP	8,400	[8,584]
c.	% original surviving	35 %	[35 %]
d.	Number surviving	15 F-111	[4 *Mirage*]

4. Total Force

a.	Total CMP (pre-strike)	328,728	[329,674]
b.	Surviving CMP	57,444	[57,831]
c.	% of total surviving	25 %	[28 %]

Soviet/WTO:

1. Forces expended <% of respective force>

a.	IRBM's (SS-20's only)	19	<6>	[34 <11>]
b.	SLBM's	0	<0>	[0 <0>]
c.	Aircraft	0	<0>	[0 <0>]

2. CMP employed <% of respective force>

a.	IRBM's	1,332	<6>	[2,383 <11>]
b.	SLBM's	0	<0>	[0 <0>]
c.	Aircraft	0	<0>	[0 <0>]

3. Totals expended <% of total>

a.	CMP	1,332	<1.3>	[2,383 <2.4>]
b.	Megatonage	8.55		[15.3]
c.	EMT	16.15		[28.9]

Source: Appendix E

Table 37

Post-Attack Analysis #2: Force Levels as of Dec 1984 [+ France]

NATO:

1. IRBM's

a.	Destroyed CMP	34,529	[34,629]
b.	Surviving CMP	18,593	[18,605]
c.	% original surviving	23 %	[20 %]
d.	Number surviving	22 GLCM/ 13 P-II	[2 S-3]

2. SLBM's

a.	Destroyed CMP	80	[120]
b.	Surviving CMP	790	[1,060]
c.	% of total surviving	91 %	[90 %]
d.	Number surviving	16 *Poseidon*/ 54 *Polaris*	[70 M-20's]

3. Aircraft

a.	Destroyed CMP	15,600	[15,938]
b.	Surviving CMP	8,400	[8,584]
c.	% of total surviving	35 %	[35 %]
d.	Number surviving	42 F-111	[12 Mirage]

4. Total Force

a.	Total CMP (pre-strike)	50,209	[50,686]
b.	Surviving CMP	27,785	[28,253]
c.	% of total surviving	49 %	[53 %]

Soviet/WTO:

1. Forces expended <% of respective force>

a.	IRBM's (SS-20's only)	14	<5>	[33 <12>]
b.	SLBM's	0	<0>	[0 <0>]
c.	Aircraft	0	<0>	[0 <0>]

2. CMP employed <% of respective force>

a.	IRBM's	981	<6.3>	[2,312 <14.9>]
b.	SLBM's	0	<0>	[0 <0>]
c.	Aircraft	0	<0>	[0 <0>]

3. Totals expended <% of total>

a.	CMP	981	<2>	[2,312 <3>]
b.	Megatonage	6.3		[14.9]
c.	EMT	12.0		[28.1]

Source: Appendix E

Table 36

Post-Attack Analysis #1: Force Levels as of Dec 1984 [+ France]

NATO:

1. IRBM's

a.	Destroyed CMP	34,529	[34,629]
b.	Surviving CMP	18,593	[18,605]
c.	% original surviving	35 %	[31 %]
d.	Number surviving	22 GLCM/ 13 P-II	[2 S-3]

2. SLBM's

a.	Destroyed CMP	170	[290]
b.	Surviving CMP	705	[895]
c.	% original surviving	81 %	[76 %]
d.	Number surviving	16 *Poseidon*/ 43 *Polaris*	[49 M-20's]

3. Aircraft

a.	Destroyed CMP	15,600	[15,938]
b.	Surviving CMP	8,400	[8,584]
c.	% original surviving	35 %	[35 %]
d.	Number surviving	42 F-111	[12 *Mirage*]

4. Total Force

a.	Total CMP (pre-strike)	77,993	[78,939]
b.	Surviving CMP	27,696	[28,083]
c.	% of total surviving	45 %	[45 %]

Soviet/WTO:

1. Forces expended <% of respective force>

a.	IRBM's (SS-20's only)	7	<2.6>	[22 <8.2>]
b.	SLBM's	0	<0>	[0 <0>]
c.	Aircraft	0	<0>	[0 <0>]

2. CMP employed <% of respective force>

a.	IRBM's	491	<2.6>	[1,542 <8.2>]
b.	SLBM's	0	<0>	[0 <0>]
c.	Aircraft	0	<0>	[0 <0>]

3. Totals expended <% of total>

a.	CMP	491	<0.5>	[1,542 <1.6>]
b.	Megatonage	3.15		[9.9]
c.	EMT	5.95		[18.7]

Source: Appendix E

"kills" on WTO systems. The greater a system becomes in value, the more destabilizing it becomes as the opposing forces become more and more inclined to preemptively strike it based on their assumptions of a high probability of success in doing so with a smaller fraction of their forces. An illustration of this situation is found in the ICBM arena with criticisms of current plans to base 100 MX missiles in former *Minuteman* silos without significant hardening capabilities. The MX has a CMP of 7,196 each compared with the older Minuteman missiles' 40.98. The silos themselves require a CMP of about 40 to ensure a kill (2 RV's per silo), a capability easily handled by the SS-18 force.

A similar situation has evolved on the theater-strategic front regarding NATO's forces. Since NATO's nuclear capabilities tend to be concentrated on fewer platforms or systems and in fewer geographic locations, they tend to be "higher value" targets than their rough counterparts. Tables 36 and 37 show the results of a Soviet preemptive nuclear strike against NATO's theater-strategic assets in a "bolt out of the blue" strike. Tables 38 and 39 show the results of another preemptive strike but one that occurs following a conventional stage of fighting during which time NATO has been able to disperse its assets. However, at the same time the Soviets have been able to reinforce theirs as well and expend them accordingly. In both cases the numbers remaining would be those available to the theater commander for a retaliatory strike.

Table 35

Overall Theater Strategic Totals (+ France)

Category	NATO	(NATO)	WTO
1. Total sys.	300	432	1,393
2. Sum, ttl. warheads	885	1,016	2,403
3. Sum, yield (MT)	329.8	430	1,383.1
4. Sum, CMP	77,992	78,942	197,891
5. Avg., warheads per platform	2.95	2.35	1.73
6. Sum, EMT	407.0	510.8	1,527.0
7. Avg., EMT per platform	1.33	1.13	1.10
8. Avg., yield per platform (MT)	0.37	0.42	0.58
9. Avg., CMP per platform	88.23	77.70	82.35

Source: Appendix E.

The question is how to interpret these figures. Table 35 is perhaps the easiest to interpret. The total number of platforms is clear enough, showing the enormous margin of superiority enjoyed by WTO nuclear forces. However this is not enough, and thus the reason for CMP, EMT, and other comparisons. It would seem in the final analysis that compared to NATO's TNF assets, the WTO theater nuclear capabilities are more widely dispersed, making each platform a "low value" target. This means that NATO is forced to expend more warheads to gain assured

Table 33

NATO/WTO Sea Based Theater-Strategic Missiles

	Poseidon	*Polaris*	M-2Ø	SS-N-5	SS-N-6	SS-N-17
1. Number	16	64	8Ø	48	384	12
2. Rng., km	46ØØ	46ØØ	3ØØØ	14ØØ	24ØØ	39ØØ
3. Yield, EMT	1.36	2.Ø5	1.ØØ	1.ØØ	1.ØØ	1.ØØ
4. CEP, nm	.25	.51	.51	1.53	.49	.77
5. CMP, ea.	22.47	7.99	3.89	Ø.42	4.11	1.69
Totals						
6. EMT	22.ØØ	131.ØØ	8Ø.ØØ	48.ØØ	384.ØØ	12.ØØ
7. CMP	36Ø	511	311	2Ø	1578	2Ø

NATO vs. WTO CMP {+ France} 87Ø (1,182) vs. 1,618

(Source: IISS, *The Military Balance*)

Table 34

NATO/WTO Long Range Aircraft

	F-111	*Mirage* IVA	*Backfire*	*Bear* B/C
1. Number	12Ø	34	21Ø	1ØØ
2. Rng., km	47ØØ	32ØØ	8ØØØ	128ØØ
3. Yield, EMT	2.Ø	Ø.15	2.ØØ	1.ØØ
4. CEP, nm	Ø.1	Ø.1Ø	Ø.Ø5	1.ØØ
5. CMP, ea.	2ØØ.ØØ	15.35	8ØØ.ØØ	1.ØØ
Totals:				
6. EMT	24Ø.ØØ	5.1	42Ø.ØØ	1ØØ.ØØ
7. CMP	24,ØØØ	522	168,ØØØ	1ØØ

NATO vs. WTO CMP {+ France} 24,ØØØ {24,522} vs. 168,1ØØ

Source: IISS, *The Military Balance 1983-84*.

nuclear exchange. While modeled on theater-strategic forces, it may be similarly expanded to include theater-tactical weapons.

a. Theater-Strategic Comparison

The first systems to be compared must by nature of the controversy they have generated be the land based missiles. That is, the *Pershing* II's, GLCM's, and to a lesser degree, the French S-3's, and the SS-4/-5/-20. This is found in Table 32.

Table 32

NATO/WTO Land Based Theater-Strategic Missiles

	Pershing	GLCM	S-3	SS-4	SS-5	SS-20
1. Number	36	64	18	223	16	400
2. Rng., km	1800	2500	3500	2000	4100	5000
3. Yield, EMT	.14	.14	1.00	1.00	1.00	.85
4. CEP, nm	.02	.02	.51	1.26	.60	.11
5. CMP, ea.	531.22	531.22	6.25	.63	2.75	70.08
Totals:						
6. EMT	5.04	8.96	18	223	16	340
7. CMP	19,124	34,000	113	140	44	28,032

NATO vs. WTO CMP (+ France) 53,124 (53,237) vs. 28,216[1]

[1]With **267** SS-20's: 53124 (53,237) vs. 18,895.

Source: Various.

The same comparison is made with SLBM's in Table 33 and with aircraft in Table 34. Table 35 gives the gross balances and totals.

For example, the SS-C-1b *Sepal* is a derivative of the sea based SS-N-3 *Shaddock*. The main mission of these missiles is anti-shipping, especially for anti-carrier warfare (ACW).

e. Theater-Tactical: Aircraft

As was the case with NATO, virtually all the WTO tactical aircraft are nuclear capable as well as having conventional capabilities. Those aircraft included here are the ones with strike/interdiction roles as a significant portion of their mission, hence the exclusion of the MiG-23 *Flogger* B/G, and the new generation MiG-29, MiG-31, and Su-27. This was done in a similar vein for NATO forces by excluding the F-14, F-15, F-106, *Lightning*, *Tornado* F.2 (air defense version), and Mirage 2000. These aircraft are summarized in Table 31.

Table 31

Soviet/WTO Tactical Nuclear Aircraft

System	Number Deployed	Number of Warheads	Yield (MT)	CEP (nm)	CMP
Blinder	165	2	1 (ea.)	0.1	200.00
Badger	40	2	1 (ea.)	0.1	200.00
Fencer	800	2	1 (ea.)	0.05	800.00
Flogger D	650	1	1 (ea.)	0.1	100.00
Fitter D	650	1	1 (ea.)	0.1	100.00

Source: IISS, *The Military Balance 1983-84*.

3. <u>NATO - WTO Nuclear Force Comparisons</u>

This section puts into perspective the numerous variables presented in the previous balance figures (e.g., CEP, CMP, etc.). The basis for this is the previously mentioned model of a theater

however, always had an overabundance of tactical nuclear missiles. Like the *Honest John* in NATO, some of the older battlefield missiles are now deployed by non-Soviet WTO forces (i.e., the SS-1 *Scud* B/C and *FROG*-3/-5) although the nuclear warheads remain in Soviet custody at sites within the Soviet Union. As part of the theater modernization program the SS-21/-22/-23 are being deployed to replace an entire generation of battlefield missiles. Again, the capabilities of these have been alluded to elsewhere. Table 30 summarizes these systems.

Table 30

Soviet/WTO Theater-Tactical Missiles & Artillery

System	Number Deployed	Yield (MT)	Rng. (km)	CEP (nm)	CMP
Soviet:					
FROG-7	440	0.2	70	0.34	7.14
SS-12	70	0.2	900	0.49	1.41
SS-21	62	0.2	120	0.16	12.73
SS-22	100	0.5	900	0.16	23.43
SS-23	10	0.2	500	0.16	13.37
SS-C-1b	100	0.35	450	0.50	3.11
180 mm	168	0.002	30	0.02	1.59
non-Soviet:					
FROG-3/-5	198	0.2	70	0.34	7.14
SS-1	137	0.2	450	1.50	0.15

Source: IISS, *The Military Balance 1983-84*.

In addition to the missiles shown above, there are a significant number deployed by submarine, surface and air forces of the Soviet Navy which may have a secondary land attack role.

range aircraft with a likely theater-strategic mission would be the *Bear* B/C carrying the AS-3 *Kangaroo*, a 650 km stand off weapon. The most likely target for this weapon would be port facilities and other "soft" targets[1]. The newer AS-X-15 ALCM carried by the *Bear* H may have theater role, but it is more likely intended for use against the U.S. homeland as a reply to the fielding of the ALCM by SAC. The *Blackjack*, a long range, supersonic bomber somewhat larger than the B-1 is expected to enter service in the 1985-86 time frame. It too is most likely intended for strikes against the U.S., but it also poses a considerable threat to NATO forces either as a CMC or with nuclear bombs. Table 29 summarizes Soviet long range aircraft.

Table 29

Soviet/WTO Long Range Aircraft

System	Number Deployed	Number of Warheads	Yield (MT)	CEP (nm)	CMP
Backfire	210	2	1	0.05	800.00
Bear B/C	100	1	+1	1.00	1.00

{CEP's est. except for *Bear* B/C -- CEP is for AS-3}

Source: IISS, *The Military Balance 1983-84*.

d. Theater-Tactical: Missiles and Artillery

The Soviets have only recently begun to acquire significant amounts of nuclear capable artillery. They have,

[1]Some wags have noted the AS-3 was intended to "sink Iceland" in view of its yield and poor accuracy.

stemming from its age and platform limitations[1]. The SS-N-6 and SS-N-17 received similar considerations when including them[2]. The more modern SLBM's (e.g., SS-N-8, -18, -20, and -NX-23) were considered to have a primary role outside of the European theater. It should be remembered though, that just as elements of the strategic triad of the U.S. might be used against WTO territory, so to may elements of the Soviet SLBM force, outside of the -5, -6, and -17, be used against NATO territory. Table 28 summarizes the sea based missile forces.

Table 28

Soviet/WTO Sea Based Missiles

System	Number Deployed	Yield (MT)	Rng. (km)	CEP (nm)	CMP
SS-N-5	48	1	1400	1.53	0.42
SS-N-6	384	1	2400	.49	4.11
SS-N-17	12	1	3900	.77	1.69

Source: IISS, *The Military Balance 1983-84*.

c. Theater-Strategic: Long Range Aircraft

The capabilities of the *Backfire* have been covered elsewhere and as such will not be repeated here. The other long

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[1]The SS-N-5 is deployed in te rapidly ageing *Hotel* class SSBN and *Golf* SSB. It is considered an obsolescent weapon, but is still deployed (see previous footnote).

[2]The SS-N-17 is deployed in the *Yankee* class SSBN. This class is roughly comparable to the early *Polaris* SSBN's of the U.S. They are subject to SALT I restrictions and accordingly, some have been converted and removed from SLBM duty.

b. Theater-Tactical Comparisons

Largely ignored but looming in the background during the recent TNF (or INF if one prefers) debates are tactical nuclear weapons in Europe. As previously noted, they made a brief foray into the light during the neutron bomb debacle in 1978, but since then have merged back into the shadows. While the theater-strategic weapons are oriented more towards deterrence, tactical nuclear weapons are intended more for war fighting with a thin veneer of deterrence to "justify" their existence. These weapons were the ones that raised such controversy with the Germans during the 1950's and may provide the spark in a future conflict that might prompt escalation up the nuclear ladder.

To gain a better understanding of the present balance of tactical nuclear forces, Tables 40-42 are provided which summarize battlefield missiles, nu-lear capable tactical aircraft, and finally a total force balance. Nuclear capable artillery was not included as only one system was available for the Soviets (S-23 180 mm) and the U.S./NATO (M-109 155 mm) wherein all the data were available to complete the requisite calculations. Aircraft (U.S.) are assumed to carry the B-43 or B-61 [Photos 6 and 7] nuclear bombs.

Table 40

Battlefield Missiles (+ France)

Category	NATO	(NATO)	WTO
1. Total sys.	361	403	1,267
2. Sum, ttl. warheads	361	403	1,267
3. Sum, yield (MT)	85.8	86.1	366.4
4. Sum, CMP	70,510	70,645	8,475
5. Avg., warheads per platform	1.0	1.0	1.0
6. Sum, EMT	126.6	130.4	534.8
7. Avg., EMT per platform	0.35	0.32	0.42
8. Avg., yield per platform (MT)	0.24	0.21	0.29
9. Avg., CMP per platform	195.32	175.30	6.70

Table 41

Aircraft: Land and CV Based (+ France)

Category	NATO	(NATO)	WTO
1. Total sys.	678	778	2,305
2. Sum, ttl. warheads	1,122	1,288	3,310
3. Sum, yield (MT)	1,122	1,125	3,310
4. Sum, CMP	244,800	246,125	811,000
5. Avg., warheads per platform	1.65	1.66	1.44
6. Sum, EMT	1,122	1,135	3,310
7. Avg., EMT per platform	1.65	1.46	1.44
8. Avg., yield per platform (MT)	1.00	0.90	1.00
9. Avg., CMP per platform	220	190	245

Table 42

Overall Theater Tactical Totals (+ France)

Category	NATO	(NATO)	WTO
1. Total sys.	1,039	1,181	3,572
2. Sum, ttl. warheads	1,483	1,691	4,577
3. Sum, yield (MT)	1,207.80	1,211.16	3,676.40
4. Sum, CMP	315,311	316,770	819,473
5. Avg., warheads per platform	1.40	1.40	1.30
6. Sum, EMT	1,250	1,265	3,845
7. Avg., EMT per platform	1.20	1.10	1.10
8. Avg., yield per platform (MT)	0.80	0.70	0.80
9. Avg., CMP per platform	212	187	180

Historically the U.S. maintained a slight lead over the Soviets with about 7,000 warheads in Europe [Ref. 83]. Since 1979 this has shifted to a 2,000 warhead advantage or the Soviets with some 6,000 warheads for the U.S. vs. 8,000 for the Soviets. As pointed out earlier a large percentage of this number for the U.S. is found in artillery shells (~5,000), many of which are over 20 years old. In fact, nuclear capable artillery is the only area where NATO holds a numerical or any other advantage over the Soviets in tactical nuclear weapons. Given the ranges and probable employment of these weapons they provide troubling implications for NATO's European members, particularly the West Germans.

However from the tables above it is clear to see that even though NATO forces maintain a rough 1.2:1 advantage in

average CMP per warhead, the Soviets hold a quantitative edge in total systems and in total CMP (almost 3:1 in the latter category). The conclusion that stems from these calculations is that the tactical nuclear force of NATO is postured to fight a limited nuclear war on or near friendly territory and forces. Counterposed is a much larger Soviet force that is less concerned about the "niceties" of a "limited" nuclear war. Rather this force is structured more to overwhelm the opponent in a nuclear sense in much the same way that conventional forces (e.g., artillery) are employed. That the war would be fought away from Soviet territory and portions of non-Soviet WTO territory, along with other considerations, is evident in the larger amount of megatonage in the inventory and greater inaccuracies, lending these weapons more suitable to "area" coverage missions rather than precise, "surgical" strikes. It is worth noting though that the new generation of battlefield missiles (SS-21/-22/-23) show substantial improvements in CEP's over the previous generation.

XIII. THE PRESENT BALANCE IN EUROPE--III

A. THE STRATEGIC GEOGRAPHIC EQUATION

Thus far the balance of conventional and nuclear forces has been addressed. Most analyses end at this point, yet there is more that needs to be considered. Military power, nuclear and conventional, is but one part of the overall or "big" picture. There is more to being a "superpower" than having dominance in strategic missiles--economic, political, cultural, and other strengths are necessary as well.

In some respects this approaches the "correlation of forces" that the Soviets are so fond of referring to. However there are non-quantitative variables that must be included in the equation as they have a direct impact on such things as military and political capabilities and influence. These are brought together with other known, readily identifiable variables in the strategic geographic equation[1] [Ref. 84]. Figure 10 illustrates this equation.

The equation finds its source in the most fundamental element of all, pure geography. Everything else stems from the four determinants of location, area, physical features, and climate. In turn, these factors largely determine the natural resources

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[1]The strategic geographic equation was developed in a series of lectures presented by Dr. R.H.S. Stolfi during the summer quarter of 1984 at the Naval Postgraduate School, Monterey, Ca.

available to be exploited by the population of a particular state or polity. The size and ethnicity of that populace and its ability to apply knowledge (i.e., technology) in the exploitation of those natural resources largely determines production.

The equation yields two products, one is potential or projected military influence based on undeveloped reserves. The other is real political-military influence as exemplified by the production capability of the state and other factors. It is these other factors that add other dimensions to the assessment of the military and overall balance of power.

These factors include multiplicative, quantifiable variables such as numbers of men and equipment and technical qualities of weapons (e.g., range, payload, etc.). Non-quantifiable factors include command style and combat spirit, and partially quantifiable factors within the strategic framework of operations (e.g., terrain, climate, etc.). These factors are integrated into the picture later. For now, the assessment of the balance of forces will be completed by addressing the fundamental aspects of the equation, namely geography, population, natural resources and production capabilities.

B. THE NON-MILITARY BALANCE

1. Geography and Populace

One of the elements that tends to be somewhat unjustifiably skewed in favor of the Soviets is the size of their land mass compared to member states of NATO. There is no denying

the fact that the Soviet Union constitutes the largest state in the world. Adding the territory of the non-Soviet WTO states to this leviathan seems to exacberate the situation, especially when one looks only at the European members of NATO. However, when the territory of the United States and of Canada are added, this disparity is narrowed. Table 43 is germane.

Table 43

NATO/WTO Area Comparisons (Major Partners)

		Area (sq. mi.)
NATO		
1.	West Germany	96,000
2.	Britain	94,000
3.	France	210,000
4.	Spain	195,000
5.	Italy	57,000
6.	U.S.	3,680,000
7.	Canada	3,850,000
	Total	**8,182,000**
WTO		
1.	Poland	121,000
2.	East Germany	42,000
3.	Czechoslovakia	49,000
4.	Hungary	36,000
5.	Soviet Union	8,600,000
	Total	**8,848,000**

While the enormous area of the Soviet Union still contributes the leading edge in total area, useable area, such as arable land (constituting only 10 % of its territory) is considerably less. Even though NATO has some 666,000 sq. mi. less land area, it holds a margin in population over the WTO by

about 173,500,000 (517,500,000 vs. 344,000,000). NATO's favorable margin implies a larger manpower reserve or "pool" in the event of a prolonged military conflict to be drawn upon, either for direct military use or in support of the military (e.g., production). This trend is expected to continue inspite of zero or near zero population growth in Central Europe (including European USSR) and the U.S., as Mediterranean countries and Central Asian and Moslem populations are expected to make up for manpower deficits in the next decade for NATO and the Soviets respectively.

2. <u>Natural Resources and Production</u>

The one natural resource that has gained the most attention both in terms of production and reserves is that of petroleum. It is no secret that the Soviets are the world's leading producers of petroleum, accounting for nearly 19% of the world total of 3,123,256,000 metric tons and weighing in at third place with proven reserves of 9.6% of world totals of 85,548,000,000 metric tons in 1979. What may surprise some is that the U.S. was close behind at 13.4 % in production with 4.6 % of the world's proven reserves. Viewed within the framework of NATO and the WTO, the combination of U.S. and British reserves and production, the latter from North Sea oil fields, serves to bring the Western Alliance within 2% of the Soviets on both accounts. The WTO on the other hand, is almost wholly dependent on the Soviets for their petroleum supply. Examining coal production one will find an advantage for NATO over the WTO, that

when subdivided (U.S.-W.Europe vs. E. Europe-USSR) finds much the same situation as with petroleum. Namely, while the U.S.-W. Europe ratios of support are slightly tilted in favor of the U.S., the WTO figures weigh heavily on the Soviets. A final note on energy resources; the U.S. and Canada dominate the worldwide reserves and production[1] of uranium with 40.2 % (28.6% -U.S., 11.6% -Canada) and 56.4 % (38.2% -U.S., 18.2% -Canada) respectively.

Turning from reserves and exploitation of natural resources, one sees the previously mentioned trend continuing in manufacturing semi-finished products (e.g., crude steel and aluminum) and finished products (e.g., automobiles and telephones). Table 42 summarizes these items.

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[1] 1978 worldwide reserves of uranium totaled 1,855,000 metric tons and 1979 production was 37,953 metric tons.

Table 44

NATO-WTO Semi-Finished and Finished Products

		Crude Steel (10^6 mt)	Aluminum (10^3 mt)	Autos in use (10^6)	Telephones in use (10^6)
NATO					
1.	W. Germany	43.8	788	23.2	28.6
2.	Britain	21.3	557	14.3	26.7
3.	France	23.2	602	18.4	24.7
4.	Italy	26.5	537	17.7	19.3
5.	Spain	12.6	---	7.6	11.9
	Subtotal	127.4	2,484	81.2	111.2
6.	U.S.	101.5	6,123	118.5	180.4
7.	Canada	15.9	1,074	10.3	16.5
	Totals	244.8	9,681	210.0	308.1
WTO					
1.	Poland	18.6	95.1	1.84	3.4
2.	E. Germany	7.3	60.0	2.4	3.2
3.	Czech.	15.2	38.3	2.3	3.2
4.	Hungary	3.8	83.0	1.0	1.3
	Subtotal	44.9	276.4	7.5	11.1
5.	USSR	147.9	1,798.0	5.0	23.7
	Totals	192.8	2,074.4	12.5	34.8

These figures in combination with those from the previous chapter help fill in the remaining quantifiable blocs within the framework of the strategic geographic equation. What remains is to illustrate the final partially- and non-quantifiable blocs. Completing this will give the reader the complete framework within which to view the debate in the next chapter over the efficacy of nuclear weapons in Europe, a question that surely ranks as one of the most important to be faced not only for this generation, but for those still to come.

3. Partial- and Non-quantifiable Factors

a. The Strategic Framework of Operations

The strategic framework of operations is a set of factors whose product yields a partially quantifiable balance. These factors are terrain and weather, war principles, and whether one is on the offensive or defensive [Ref. 85]. To illustrate the role of these factors in the overall balance, bad weather may be modeled mathematically somewhat regarding the effect it may have (e.g., sorties scheduled/made/cancelled as a result of weather, reduced visibility and its effects on target acquisition, engagement, destruction, and kill assessment, etc.) on the battle. What is not quantifiable (and hence accurately modeled) is whether one is on the defense and caught by a surprise attack on a narrow or broad front. This factor may change over a period of time as the attack unfolds and the defender steels himself to defend his home territory, or conversely, collapse like a rotten apple that is stepped on. War principles figure in as they seek to exploit the advantages of offensive/defensive actions, terrain, forces on hand/on reserve, and so forth, for fighting the battle to a decisive conclusion.

b. Operational and Combat Styles

One of the most neglected factors in assessing the balance of forces in this age of computer enhanced operations analysis and research is the role of operational style as exemplified by the style of the commanders and their staffs, and of combat style as exemplified by troop spirit and determination.

One of the assumptions typically made is that it doesn't matter either because it would play an insignificantly small role in the overall balance or it falls into the category of "too hard" in trying to develop a mathematical model for these factors.

Another reason why these have not been examined in too great a detail, especially by American commentators and analysts, lies in the unhistorical nature of American society which tends to minimize things or events that may have occurred more than a few years ago. Hence the reason for the first part of this thesis which examined the historical background of nuclear weapons in Europe. The importance of the historical condition or style of a nation's armed forces is cited by von Mellenthin and Stolfi when they state:

> Armed forces possess historical instincts which can be considered systematically and used both to obtain a more accurate measure of the peacetime military balance, and to forecast the outcome of potential wars. The Soviet emphasis on large numbers of men and weapons is based on the historical style and instincts of the Russian armed forces. [Ref. 86]

A more specific and detailed accounting of the role of operational and combat style, especially as applied in wartime "case histories" is found in von Mellenthin and Stolfi [Ref. 87]. For purposes here, in a potential combat situation between NATO and WTO forces, the Soviet commander will find himself encumbered by rigid planning, constant requirements to report to superiors, and a "dual" chain of command with assignment of "political officers" to his unit. Much talk is made of the drunkenness,

lack of initiative, etc. of the common soldier and other problems within the Soviet Army, as well as potentially unreliable non-Soviet WTO allies. However, these assertions should not be wholly relied upon, for the Soviet combat soldier has shown himself to be a fierce fighter, able to exist on the slimmest of rations, and exhibit strong patriotism. Additionally, some writers now stress the growing integration of WTO forces and their concomitant increasing reliance on the Soviets [Ref. 87].

Set against this are the members of NATO whose combined historical conditioning allows commanders to be more flexible in the employment of troops (an attribute that would be enhanced by adopting mission-type orders[1] for commanders and cutting the growing numbers of career "staffers") and combat troops faced with the defense of their homeland. Within this context, combat style, the Western alliance has seen an upturn in the professionalism and spirit of the personnel in their respective armed forces.

C. THE BALANCE OF FORCES - SUMMARY

The final assessment of the balance of forces or of power in Europe tends to be the following. On the part of the West, exemplified by NATO, and including the forces of France who

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[1] Mission-type or oriented orders are brief orders that set major objectives to be accomplished by the commanders. These types of orders relied heavily on the judgement and character of commanders and troops.

ultimately is enmeshed in the Western historical condition, the numbers may seem overwhelming and potentially morally discouraging. However, more detailed analysis points to closer margins in conventional forces than initially suspected. Looking to potential capabilities the picture grows somewhat brighter when one considers the enormous potential inherent in Western productive capabilities for turning out the equipment and even manpower for defending itself from aggression. The image that comes to mind is that of a long distance runner that is taking easy strides, exerting but a small portion of the stored energy reserves.

On the other hand there is the situation of the Soviets. They are faced with a hostile, developing nation with enormous manpower reserves (China) on one long, contiguous border, and a cluster of dependent, satellite states on the other who have, with few exceptions, little reserves or capabilities of their own, and an economy that by any reasonable measure is a failure. True, they have managed to build an awesome military machine of seemingly overwhelming capability, and through extreme sacrifice have managed to bring numbers and technological capability of various weapons to if not parity, then superiority compared to similar ones in the west. Yet the Soviets lack many other aspects of a true superpower, resembling in many respects one of the poorer developed nations in the so-called "Third World." The image here is of a sprinter caught in a long distance race who is

not inconsiderable number of vehicles, personnel, etc. and would hardly be conducive to covert movement. The situation is exacerbated by the restricted area and moderate to high population density of the regions within which these weapons are deployed. Without sounding too paranoid, it is not inconceivable that Warsaw Pact agents are in place whose sole mission is to report such movements, coincident with other intelligence collection measures. The second qualification, arrival on target, is addressed below.

Turning to the air-breathing force, the dispersal matter is even more critical. For though a GLCM flight or *Pershing* firing battery may secret themselves in small clearings or the like, there are only so many airfields that the F-111's may operate out of, rendering them even more susceptible to first strikes. As was previously alluded to, these are subject to many of the same vulnerability problems faced by the bomber leg of the U.S. strategic triad.

Yet another aspect of survivability lies in the matter, not always simple, of ensuring the weapons get on target. Weapon system reliability aside, this means that they are able to surmount the formidable defenses that will confront them over WTO territory. A recent USAF forecast [Ref. 92] estimates that within fifteen years, Warsaw Pact forces will have in place over 5,000 SAM's, 8,000 fighter aircraft and 10,000 radar controlled anti-aircraft guns with proximity fuzes. Combined with the technological upgrades of the PVO mentioned earlier, the gauntlet

B. MATTERS OF WEAPONS

To ensure the credibility of the NATO nuclear deterrent, as implemented under flexible response, there are two primary, military considerations to consider. The first of these is the survivability of the theater-strategic forces. The second is the flexibility in employment offered by NATO's nuclear forces.

1. Survivability

A deterrent rapidly loses its credibility if the opponent perceives that he can remove it with little or no risk and at minimal cost to himself. While simplified in some aspects, the model in Appendix E shows that the current and future land-based missile and air breathing legs of the theater-strategic triad of NATO are in fact vulnerable and quite possibly could suffer devastating losses in the face of a "small" preemptive strike.

To an extent, the GLCM's and *Pershing* II's survivability is enhanced by their ability to redeploy. However, this is subject to qualification. The first qualification is that this survival is dependent on covert dispersion during a time of increasing tensions, precisely such a time when both sides will be extremely sensitive to movements of just such a nature. A GLCM caravan or "flight" of 16 missiles (the normal dispersal mode) consists of two Launch Control Centers (LCC's), four Transporter Erector Launchers (TEL's) with four missiles per TEL, 16 support vehicles and 69 ground personnel. At some locations (e.g., RAF Molesworth with 6 flights assigned) this approaches a

niceties of "fraternal assistance" aside. Other problems are definitional, namely what constitutes first use. In a crisis situation one of the first moves by NATO would be to disperse its nuclear assets. Such a move might well be interpreted by the Soviets as the prelude to a NATO nuclear strike and prompt them to launch a strike.

The overall effect of adoption of NFU by NATO then would be a false appearance of enhanced security for Western Europe. A final note on no first use is in order. In 1978, the U.S. and Britain gave assurances that, in keeping with the provisions of the Non-Proliferation Treaty, they would not use nuclear weapons against any non-nuclear states that were also parties to the NPT. The a cepted reservation of course was in the event of an armed attack on themselves by a non-nuclear state in association or alliance with another nuclear-weapon state.

In summary, the breeding ground for either alternatives or supplements to the current doctrine of flexible response is quite fertile. However the political realities are such that for the immediate future the doctrine of flexible response and its attendant conventional force structure and operative strategies as well as the nuclear doctrine of controlled response will remain in its present form for the foreseeable future. What remains then is to examine certain aspects of the nuclear force structure in an attempt to see what the future holds in the way of changes and improvements; stability or instability.

battles in the heart of West Germany. Granted there is a certain "head-in-the-sand" approach here that belies the potential flaw in forward strategy -- namely that while Allied forces provide a seemingly "solid" front deployed linearly along the common border, well placed and directed WTO assaults at critical stress points will fracture this solid front like a fine crystal goblet. The resulting downward turn in events for NATO forces then prompts the start of the nuclear "action chain" and subsequent vertical escalation of the conflict.

A notion that has gained increasing popularity is that NATO should commit itself to a declaratory policy of "no first use" of nuclear weapons. On the surface this has a certain fuzzy appeal that distorts reality. Most of its proponents argue that conventional defense measures would obviate the need for nuclear weapons. Yet as the previous discussion has shown, there is no consensus on what conventional doctrine/force structure would meet this stipulation. Furthermore, there must be absolute certainty that a conventional defense will succeed.

Others have noted that the Soviets have adopted a no first use policy and on that basis so should NATO. Again, there is a certain amount of naivete at work here based on wishful desires of the Soviet Union. First, there is no guarantee that the Soviets would respect such a pledge given their performance in holding to other pledges; to wit, the threat or use of force (Art. 2 U.N. Charter) against other nations, the socialistic

accompanying a WTO armored assault, not to mention problems in coordinating efforts among the various "dispersed" units.

A second, defensive strategy relies on maneuver and and certain non-quantifiable advantages that accrue to the West. This was discussed in Chapter XIII within the framework of the strategic geographic equation. Unlike the the vagaries associated with the "area" defense concept above, the tactical principles behind maneuver defense have been proved in combat and merit further consideration. Compared with the present operational doctrine of forward defense, the adoption of the principles offered in maneuver defense potentially stand to raise the nuclear "threshold" as the prospect for thwarting a WTO offensive brighten.

However, as we have already seen, the fact that something works (or does not work) in the heady atmosphere of military theory does not guarantee its acceptance or rejection in the real world. Such is the case with maneuver defense, for one of the central tenants of this operational doctrine is that NATO not fight to keep very square inch of territory. Rather, it requires that the dug in mentality of forward defense make way for increased mobility, especially with armor and mechanized infantry in concert with strongly reinforced "anchor" points co-located with strategic avenues of advance. The major problem with this lies in the refusal of successive West German governments to accept any operational doctrine that requires NATO to surrender, even temporarily, any German territory and potentially fight

particularly by Soviet forces. It should be remembered that these counter-offensives are more than strikes by aircraft and conventional long range artillery and rocket forces against the "second echelon" WTO forces. Rather, it is a full blown counter-invasion of East Europe (or portions thereof). NATO was conceived as and is bound by its charter to be a *defensive* alliance. Any move to adopt an offensive strategy by NATO would surely be met by very strong opposition in Europe; particularly since many vestiges of *detente* remain in place between East and West Europe.

Looking to the defensive strategies, two are very much in evidence, one in favor with the Left in Germany and the other finding favor with factions within the various military reform movements in the U.S. and Germany. The first is one of "area" defense wherein NATO forces would allow WTO forces to penetrate deep into Germany and then be subject to "guerilla" warfare by roving bands of missiliers armed with ATM's spread throughout the countryside. This strategy is aptly known as an "attrition sponge" strategy. The Left is attracted to this strategy since such a force structure would be less dependent on a large army supported by mechanized equipment and artillery, air forces, etc., as well as reducing requirements for stationing foreign (e.g., U.S.) troops on German soil. It quickly becomes evident though that such forces would be extremely vulnerable to infantry

measures. The problem with this approach is that the driving factor here, economics, has also tended to figure prominently in the strategic arms control negotiations with subsequent poor results. In other words, the U.S. looked to arms control solutions to satisfy domestic budgetary requirements rather than addressing genuine security interests. The results of SALT and their attendant problems have come to be well known and when teamed with Soviet actions, figured largely in the decline of public and official support for *detente* in the U.S. One also need look no further than the MBFR talks to see the very difficult problems stemming from attempts at conventional arms control negotiations. For the near future then, arms control can not be considered as a viable alternative to flexible response. The final candidate for consideration is a change in the operational strategy of NATO's conventional forces to one wherein conflict escalation may be halted prior to use of nuclear weapons.

Within the topic of change in operational strategy are two dominant schools oriented towards offense and defense. The offensive school generally argues for an immediate NATO counter attack into WTO territory, well beyond the FEBA. Some members even call for a preemptive strike against WTO forces should it appear they are preparing to attack NATO forces. There are certain dangers inherent in both arguments, the central one being the risk of dramatically expanding the scope of conflict and in fact ***increasing*** the likelihood of the use of nuclear weapons,

will drop from their present manning level of 495,000 to 290,000 in the mid-1990's [Ref. 91].

In the U.S. the all volunteer military and "petering out" of the post war "baby boom" will likewise have an effect on manning levels. Even if these were not factors, it is unlikely that there would be strong domestic support in the U.S. for increasing troop levels in Europe. This is especially the case in Congress where there is some latent anti-European sentiment and strong pressure for reducing the percentage of the burden borne by the U.S. as well as competing requirements outside of NATO (especially in the Middle East and growing commitments in Central America).

Another option requiring increased outlays is that of investing in highly sophisticated weaponry -- the technological trump card. The advantages and problems of this doctrine were covered in Chapter XI. It is therefore sufficient to reassert that as this century closes, the advantages posed by superior technology on the battle field will eventually be lessened by high R&D and maintenance costs as well as growing Soviet abilities to close the so-called "technology gap." However, efforts in this field still should not be abandoned. Rather, they should be looked upon as force **enhancers** instead of force **multipliers** or **replacements.**

One option that is put forward as requiring a minimum of costs to Alliance members is to seek security in arms control

Table 45

NATO Defense Spending[1] (%), 1982-83 & 1983-84.

Nation	1982-83 Spend.	1982-83 Infl.	1982-83 Diff.	1983-84 Spend.	1983-84 Infl.	1983-84 Diff.
Belgium	+ 3.6	+ 7.7	+ 4.1	+ 7.8	+ 5.3	+ 2.5
Canada	+ 5.6	+ 3.8	+ 1.8	+14.7	+ 3.8	+10.9
Denmark	+ 7.8	+ 6.9	+ 0.9	n.a.	+ 3.8	n.a.
France	+11.5	+ 5.9	+ 5.6	+ 6.5	+ 7.1	**- 0.6**
Germany	+ 4.2	+ 3.3	+ 0.9	+ 2.9	+ 1.5	+ 1.4
Greece	+ 9.7	+20.5	**-10.8**	+28.5	+18.9	+ 9.6
Italy	+17.1	+14.6	+ 2.5	+18.8	+ 9.9	+ 8.9
Luxembourg	+11.1	+ 8.7	+ 2.4	+ 9.1	+ 3.9	+ 5.2
Netherlands	+ 5.5	+ 2.8	+ 2.7	+ 5.0	+ 2.8	+ 2.2
Norway	+13.1	+ 8.4	+ 4.7	+ 6.6	+ 6.1	+ 0.5
Portugal	+20.3	+25.5	**- 5.2**	+20.1	+27.1	**- 7.0**
Turkey	+24.3	+28.8	**- 4.5**	+44.2	+50.7	**- 6.5**
Britain	+15.2	+ 4.7	+10.5	+ 9.7	+ 4.6	+ 5.1
U.S.	+10.6	+ 3.2	+ 7.4	+15.1	+ 4.2	+10.9

[1] Defense spending figures based on NATO figures, using NATO definitions. Figures vary from those in national defense budgets because of differences in definition. Comparisons are based on local currencies. Inflation figures supplied by the Organization for Economic Cooperation and Development. The 1983-84 inflation rate is based on the 12-month period ended September, 1984.

Source: *Aviation Week and Space Technology*, January 21,1985. pg. 109

Even assuming that the various member nations were to increase their defense spending to levels necessary to purchase a larger inventory of equipment, demography, particularly German, presents a problem. John Mearshimer [Ref. 90] notes that Germany will begin experiencing severe manpower shortages as early as 1987 which will increase in severity as the years pass. As such, with the current system of conscription, the German armed forces

speak, concerns conventional strategies offered as substitutes to nuclear oriented ones.

2. Conventional Strategies

One of the other thorns troubling NATO since its inception is the role of conventional forces and the extent to which they should be maintained. As seen, the 1952 Lisbon Conference set a goal of building to 96 divisions as a conventional force structure deemed necessary to counter Soviet led forces. Since then though, NATO has fallen well shy of building to these levels. Still, matching the Soviets one-for-one in manpower and equipment represents one of the conventional doctrines that is still held to by some analysts and commentators. Chapter XI showed that in some areas, NATO was numerically close to Pact force levels while enjoying superiority in others. By and large though, NATO forces remain quantitatively inferior, especially when figuring in Soviet reserves, an advantage that accrues to the Soviets due to geographical factors.

The problem then as now remains one of committing substantial amounts of national and Alliance (European as well as U.S.) resources to such an end. However, it has only been with a great degree of pleading, cajoling and threatening that the U.S. has prodded the various European members of NATO to a goal of increasing defense spending by 3% per year after inflation. As Table 45 shows, results have been mixed.

model in Appendix E[1] bears out some aspects of this argument. The reality of the situation though is that the area that will be most affected is one of the more densely populated regions in the Northern Hemisphere, Central Europe, whose people and government do not look kindly upon any mention of nuclear warfighting in Europe.

Furthermore, in the absence of deployment of the ERW or intensive development of very low yield or "tailored" yield weapons, collateral damage and commensurate civilian casualties would not be held to low levels with initiation of large scale use of theater nuclear weapons. Additionally, the Alliance would have to be prepared to "pre-delegate" authority to military commanders to use nuclear weapons. Therefore, it may be safely said that this policy is wholly unacceptable to European leaders, without whose assent any new doctrine would not be workable. The sensitivity of Europeans to the nuclear warfighting doctrine is seen in their reaction to some addmitedly mild public discussion by members of the Reagan Administration about having to fight a "limited" nuclear war in Europe.

For the foreseeable future then, the alternative nuclear strategies offered to replace flexible response are either obsolete themselves or not viable because of implementation problems. The other side of the coin, so to

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[1]See especially Appendix E-7 and E-8.

may be subsummed as "alternative" nuclear doctrines and those relying wholly on conventional forces. Straddling the gap between these two schools of thought is the doctrine put forward by McGeorge Bundy et al [Ref. 88] recommending the adoption of a "no first use" (NFU) policy by NATO.

1. Alternative Nuclear Doctrines

The chief alternatives to controlled response, the nuclear operational doctrine of flexible response, are a return to "massive retaliation" (MC 14/2) or acceptance of a theater nuclear warfighting doctrine. Neither one is acceptable though for reasons which are enumerated below.

The policy of massive retaliation is viable only in the face of both overwhelming nuclear superiority and invulnerability of the United States to a Soviet second strike. This holds true for both strategic and theater matters. However, the development and maintenance of an invulnerable Soviet second strike capability (*viz.* highly mobile SS-20 force) coupled with an immense build up of theater and strategic nuclear forces by the Soviets has rendered this doctrine obsolete.

The other doctrine, nuclear warfighting, encounters problems in implementation--both politically and militarily. Van Cleave and Cohen argue in their work on tactical nuclear weapons [Ref. 89] that it does not necessarily follow that employment of Soviet and American nuclear warheads will result in large-scale collateral damage. Indeed, in some respects the

XIV. THE ROLE OF NUCLEAR WEAPONS IN EUROPE

For now we see through a glass, darkly....

-- I Corinthians 13:12

Indeed, since the false dawn at Alamogordo, New Mexico forty years ago, individuals and governments have sought clearer definition of the role, if any, nuclear weapons have in national and alliance strategies. As the previous chapters have shown, the post war situation in Europe has proven to be very fertile ground for development of thought and weapons in this regard. This chapter summarizes the previous discussion and critically examines the role played by nuclear weapons in Europe. The first part examines conventional and nuclear doctrines, especially some of the popular schemes currently being proposed while the second part looks at the weapons involved. The final chapter follows with recommendations and conclusions.

A. MATTERS OF DOCTRINE

C'est une drôle de guerre.

The doctrine of flexible response has been NATO's declaratory doctrine since the adoption of MC 14/3 in 1967. In recent years this policy has been affirmed in a number of multilateral actions with in the Alliance. This is not to say that there are no criticisms of flexible response nor any number of alternatives that have been put forward to supplement or replace it. These

struggling to remain tied with the lead runner while expending almost all its reserves.

In consideration then of the scenario above, the question inexorably arises "why nuclear weapons?" Why nuclear weapons if the West as such tremendous production capabilities and conventional potential to deter Soviet aggression with a moderate expenditure of effort ? Why risk the destructive consequences of a nuclear war in Europe by relying on tactical nuclear weapons to stem Soviet aggression if in fact these potentials exist? These questions have been and continue to be part of the ongoing nuclear debate which is addressed in the following chapter.

the GLCM's, F-111's and their successors (if any) would have to run is staggering. There is some possibility that the *Pershing* too may be susceptible to PVO measures.

For the foreseeable future then, the only leg of NATO's theater-strategic triad assured survivability is the sea-based leg found in the *Poseidon* and *Polaris* (later *Trident*) SLBM's. The SLCM is not counted here inspite of its capabilities because of a very real possibility it will be sacrificed on the altar of arms control or unilaterally cut from U.S. forces by Congressional action. There are some problems though with the current sea-based leg. The foremost has already been mentioned, that is, the effect of strategic arms control. Second, the very nature of the SLBM is such that their use would most likely come in the form of a General Release (i.e., the release of all of SACEUR's nuclear assets in the event of an all out war). Such an action renders moot consideration of controlled response and conflict limitation. The capabilities of carrier-based nuclear attack aircraft should not be overlooked even though they are not always considered to be theater-strategic systems. Those that decry the "vulnerability" of the large CV would be surprised at how well a CVBG can disguise and defend itself in certain circumstances. However, current capabilities are such that the aircraft involved, the A-6E and the A-7E, are subject to the same constraints/conflicting missions as land-based aircraft not dedicated to the nuclear mission.

Finally, one aspect of survivability that goes hand in hand with dispersal is sustainability of the systems once dispersed. Consideration here must be given not only to consumables (human and machine), but also on maintaining rapid, *secure* command and control over these units once dispersed. Compounding the problem is the very real likelihood these systems will be forced to survive and operate in severe chemical, biological and/or nuclear environments, all of which serves to degrade operability and sustainability.

2. Flexibility

The other military consideration is to ensure that NATO's nuclear forces maintain a degree of "flexibility." In other words, maintain an ability to threaten a wide range of targets and carry out strictly [highly selective and limit collateral damage. It should be kept in mind that this latter aspect is sometimes too narrowly defined, being limited to theater-tactical weapons and their immediate battlefield use. The doctrinal problems associated with this circumscribed approach have already been touched upon.

Flexibility here is extended to the full extent of theater-strategic systems; systems that will be called upon for attacks ranging from (possibly) the front line to rear echelon staging areas and perhaps ultimately to military-industrial targets in the Soviet Union, thereby linking the Soviet homeland to conflict in Europe. Therefore, the ever popular "show of

resolution" nuclear strike does not necessarily have to come in the form of a battlefield nuclear weapon. It may well be a strike with medium range assets against targets deep in Pact territory.

The historical record shows that when NATO adopted flexible response in 1967, the force structure it inherited was one that had been haphazardly acquired during the era of massive retaliation and thereby had weapons with large yields and poor accuracies. Slowly the character of the stockpile has shifted to weapons of greater accuracy and sometimes of lesser yield. This trend was firmly ensconced with the deployment of GLCM's and *Pershing* II's beginning in November 1983. These weapons, to be sure, add significant flexibility to NATO's arsenal in light of their phenomenal accuracies. Reinforcing this trend is the withdrawal of *Nike Hercules* nuclear SAM's, older nuclear artillery shells and some ADM's.

C. SUMMARY

The trend towards greater survivability and flexibility in NATO's nuclear forces pales in comparison when placed beside the robust growth in size and capabilities of Soviet theater forces. The SS-20 (aptly named *Pioneer* by the Soviets) represents the essence of survivability and flexibility. Survivability in that the greater portion of its basing lies outside of the range of all of NATO's land-based systems with the sea-based leg adding scant increased coverage (Figures 6 and 8 are germane). Flexible

in that it has the proper combination of accuracy and yield to engage in the very sort of selective, low collateral damage strikes that NATO holds to under flexible response.

The net effect is to cancel the effectiveness and thereby the deterrent aspects of some parts of NATO's doctrine. At present, NATO is thwarted from threatening to use nuclear weapons, tactical or strategic, to counter a successful WTO conventional offensive because of the threat in return of Soviet massive retaliation with their numerically superior theater forces. In turn, NATO's own theater-strategic forces (with the exception of the SLBM's) are faced with extinction through a preemptive strike, or barring that, are confronted with a "target rich" (more targets than existing systems can reach, much less strike) environment. In the highly unlikely event that a genuine arms control agreement will be reached in the near future and given the present plans for deployment, this disparity will continue well into the next decade.

XV. RECOMMENDATIONS AND CONCLUSION

A. RECOMMENDATIONS

1. Conventional Doctrine

Recommendation: NATO should adopt a doctrine of mobile defense emphasizing mechanized forces (both armor and infantry) combined with immediate strikes by conventionally armed aircraft and missiles against the strategic rear or "staging areas" of WTO forces. For maximum effectiveness the aircraft and missiles should be armed with a variety of "smart" PGM's and mass-destruction *conventional* weapons (e.g., fuel-air explosives, fragmentation optimized submunitions, etc.).

Benefits: Mobile defense gives NATO a better opportunity to regain the initiative and as a result, to cope with a wider variety of Pact offensives. Upon regaining the initiative, NATO has the opportunity to use it to stop conflict at the level of its own choice, thereby preventing an escalation to the employment of nuclear weapons.

2. Nuclear Weapons and Doctrine

Recommendation: NATO should reject a policy based on "no first use" of nuclear weapons for reasons previously mentioned (e.g., operational differences between what NATO and WTO commanders see as defining first use of nuclear weapons).

Benefit: If NATO were to adopt a no first use policy, WTO commanders would be faced with increased certainty with regards to projected NATO actions. In turn, WTO risks would be diminished thereby increasing the possibility of conflict.

Recommendation: The process started by the Montebello Decision (i.e., the withdrawal of obsolete tactical nuclear warheads) should be extended to all tactical nuclear weapons. In particular, nuclear artillery shells, nuclear warheads for short range missiles (e.g., *Honest John* and *Lance*) and ADM/SADM's should be removed from Europe and destroyed. Medium range systems (including tactical aircraft) should be converted to conventional capability either by upgrade or replacement. This conversion should take place as part of an arms control agreement covering such systems.

Benefits: The credibility of any armed forces (especially NATO) employing battlefield nuclear weapons is suspect today. The presence of such weapons, either stockpiled in a few, centralized locations or deployed close to potential battlefields, is highly destabilizing and unnecessary given the potential strengths of a mobile, conventional defense. By significantly reducing the nuclear stockpile in Europe, which is largely made up of tactical nuclear weapons, West European governments may accordingly experience a reduction in domestic pressure, for example, as represented by the Leftist dominated anti-nuclear movement.

Recommendation: In the absence of an arms control agreement on theater-strategic systems, the current deployment of the *Pershing* II and GLCM must continue. NATO planners must ensure the survivability and sustainability of the land based legs of the theater-strategic deterrent as well as their command and control links through both active (defense) and passive (dispersal) measures. The strategic defense initiative (SDI) holds great promise for defense against IRBM's and must be extended to protect Europe against the SS-20 and other MR/IRBM's. European members of NATO should be strongly encouraged to participate in the research and development of such a program with promises of technology exchange. Wider dispersal, especially of aircraft, is also recommended. Additional thought should be given to basing at sea, i.e., using converted *Poseidon* SSBN's (removed from this duty under SALT) deployed with SLCM's. In addition to guaranteeing the survivability of theater-strategic forces, NATO force planners should also direct efforts towards ensuring the ability of these systems to reach their targets. These efforts would entail improvements both in range (and thereby coverage) and penetration (e.g., on board jammers, reduced observability, terminal maneuvers, etc.).

Benefits: The continued growth of Soviet theater-strategic forces cannot be allowed to go unanswered. This growth was the stimulus for the 1979 decision for the U.S. to deploy the new intermediate range weapons--the GLCM and *Pershing* II. The credibility of theater-strategic forces is enhanced because

they decrease certainty in the minds of Soviet commanders about the Soviet capability to eliminate substantial portions of NATO's theater-strategic force with a small fraction of their own conventional ***or*** nuclear forces. It must be emphasized again that this enhancement of survivability is an ***interim*** measure and that efforts should be directed towards **elimination** of this species of weapon on **both sides.**

Recommendation: Arms control negotiations are imperative in both a military and political sense. The U.S. must continue efforts in good faith to this end. The INF negotiations should be changed from a bilateral forum to a multilateral one--incorporating the forces of France, Britain and China. Barring multilateral negotiations, U.S. negotiators should seek to minimize the impact of those forces on any agreement.

Benefits: While prospects for a workable agreement are distant, engaging in negotiations again eases domestic pressure in both the U.S. and West Europe. When approached in the proper manner (i.e., with patience), arms control agreements in this area could yield notable increases in security.

B. CONCLUSION

Forty years ago, American planners were striving to define what role, if any, nuclear weapons would have in the defense of Europe. Nuclear weapons, and the deterrent provided by their awesome destructive power, were the very bedrock on which NATO was founded in 1949. Yet down through the years, nuclear

doctrine has swung between the two poles of strict restraint and free use, with seeming little regard for consequences to the people of Europe. To complicate matters, technology has often apparently determined doctrine, many times with unforseen consequences. For its part, the Soviet Union, driven both by internal dynamics and external stimuli, has correspondingly compounded difficulties. NATO (and especially the U.S.) has become a modern day Prometheus; inexorably bound to the rock of nuclear weapons and seemingly doomed to eternally suffer the eagle of ambiguous doctrine plucking at the vitals of the Alliance.

Nevertheless, there is cause for justifiable optimism that the present situation may be ameliorated. To do so requires that NATO recognize its inherent superiorities that are both directly and indirectly related to the military balance--what some call the "correlation of forces." In part, by adopting the recommendations listed above, NATO can be assured of regaining the initiative to prevent conflict or terminate conflict at a level of its own choosing without wholesale dependence on nuclear weapons.

We have the means at our disposal to embark on such a course. To do so requires that the Alliance close ranks and stepforward in a decisive, forthright manner.

The only thing necessary for the triumph of evil is that good men do nothing.

-- Edmund Burke

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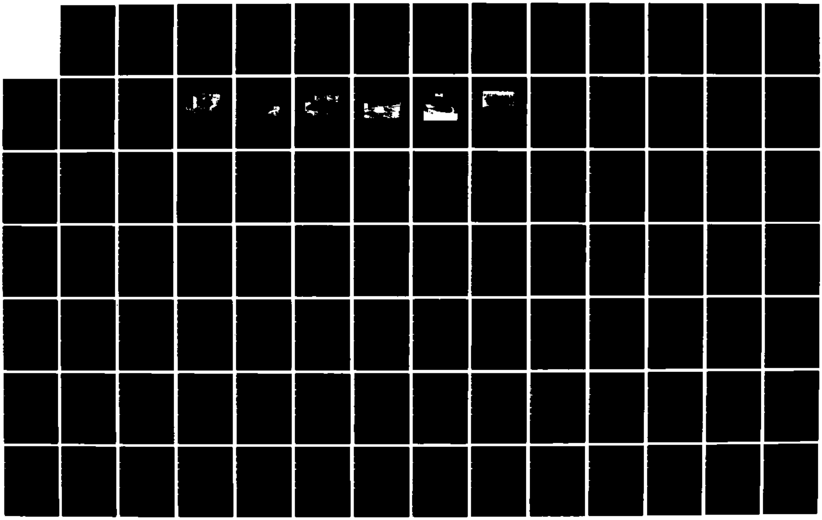

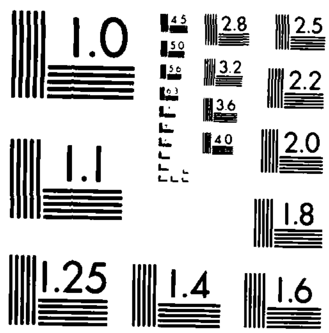

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90. Mearsheimer, J., "Nuclear Weapons and Deterrence in Europe," *International Security*, p. 34, Winter 1984-85.

91. Ibid.

92. "USAF Forecasts Growing Soviet Arms Threat," *Aviation Week and Space Technology*, p. 88, January 28, 1985.

APPENDIX A

GLOSSARY

ABM	Anti-Ballistic Missile
ADM	Atomic Demolition Munition
AEW	Airborne Early Warning
AEW&C	Airborne Early Warning and Control
ALBM	Air-Launched Ballistic Missile
ALCM	Air-Launched Cruise Missile
ASM	Air-to-Surface Missile; Anti-Ship Missile
CBN	Chemical, Biological, Nuclear Warfare
CDU	Christian Democratic Union (West Germany)
CEP	Circular Error Probable
CG	Guided Missile Cruiser
CGN	Guided Missile Cruiser, Nuclear Powered
CMP	Counter Military Potential
CTOL	Conventional Takeoff and Landing
DCA	Dual Capable Aircraft
DD	Destroyer
DDG	Guided Missile Destroyer
ECM	Electronic Countermeasures
ECCM	Electronic Counter-Countermeasures
EMP	Electromagnetic Pulse
EMT	Equivalent Megatonage
ERW	Enhanced Radiation Weapon
FBS	Forward Based System(s)

FEBA	Forward Edge of the Battle Area
GLCM	Ground Launched Cruise Missile
HICBM	Heavy Intercontinental Ballistic Missile
ICBM	Intercontinental Ballistic Missile
INF	Intermediate range Nuclear Forces
IOC	Initial Operational Capability
IRBM	Intermediate Range Ballistic Missile
JSTPS	Joint Strategic Target Planning Staff
KT	Kiloton
LNO	Limited Nuclear Option
LRTNF	Long Range Theater Nuclear Forces
MAD	Mutual Assured Destruction
MaRV	Maneuverable Reentry Vehicle
MIRV	Multiple Independently-targeted Reentry Vehicle
MLF	Multi-Lateral Force
MRBM	Medium Range Ballistic Missile
MRV	Multiple Reentry Vehicle
MT	Megaton
NATO	North Atlantic Treaty Organization
NCA	National Command Authority
NM	Nautical Mile
PVO	*Protivovozdushnaya Oborona* (Air Defense)
QRA	Quick Reaction Alert; Quick Reaction Aircraft
RV	Reentry Vehicle
SAC	Strategic Air Command (USAF)

SACEUR	Supreme Allied Commander, Europe
SALT	Strategic Arms Limitation Talks
SAM	Surface-to-Air Missile
SDI	Strategic Defense Initiative
SDV	Strategic Delivery Vehicle
SLBM	Submarine Launched Ballistic Missile
SLCM	Submarine Launched Cruise Missile
SPD	Socialist Democratic Party (West Germany)
SRBM	Short Range Ballistic Missile
SSBN	Nuclear Powered Ballistic Missile Submarine
SSGN	Nuclear Powered Guided Missile Submarine
SSM	Surface-to-Surface Missile
SSN	Attack Submarine, Nuclear Powered
START	Strategic Arms Reduction Talks
TNF	Theater Nuclear Force
TVD	Teatr Voyennykh Deystviy -- Theater of Operations
VRBM	Variable Range Ballistic Missile
VSTOL	Vertical/Short Takeoff and Landing
WTO	Warsaw Treaty Organization (also Warsaw Pact)

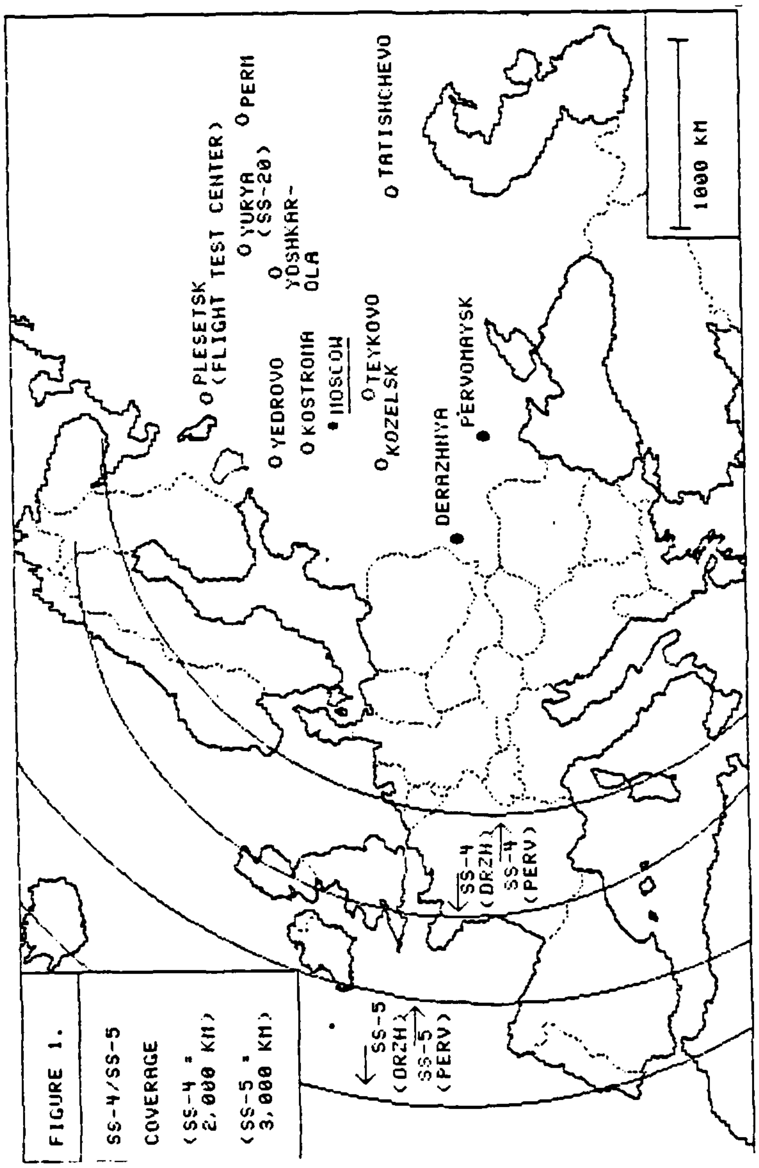


Figure 1. SS-4/SS-5 Coverage.

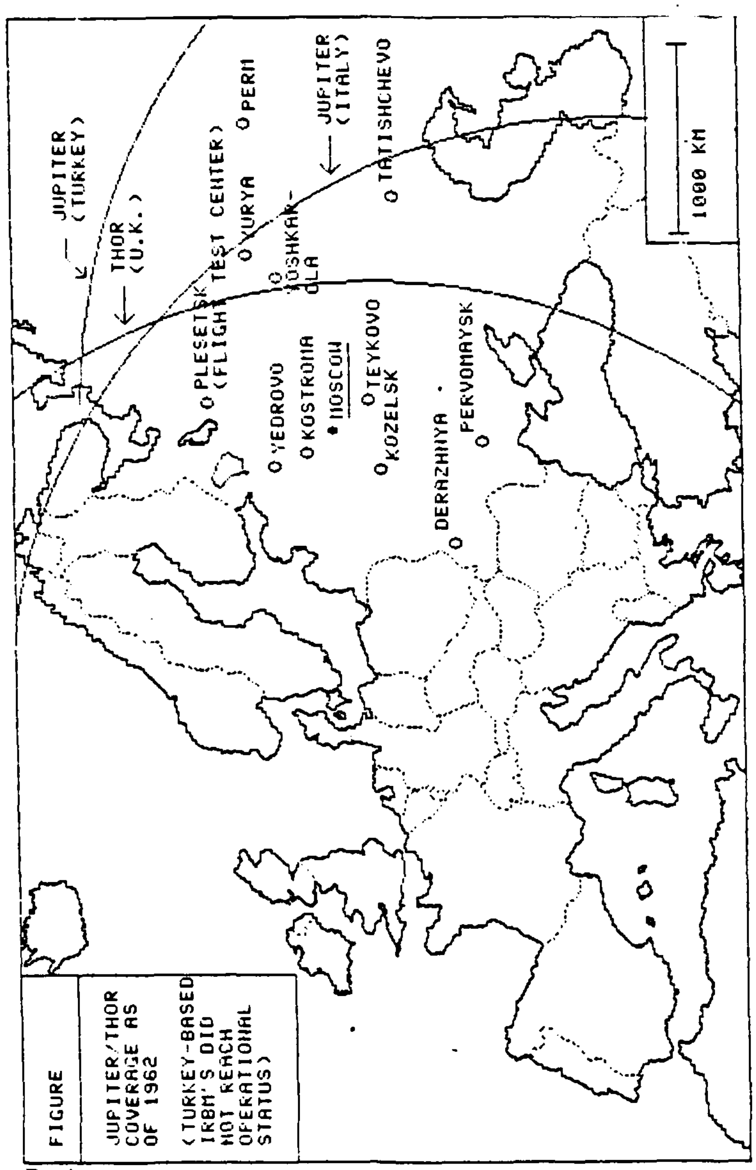


Figure 2. *Jupiter/Thor* Coverage (as of 1962).

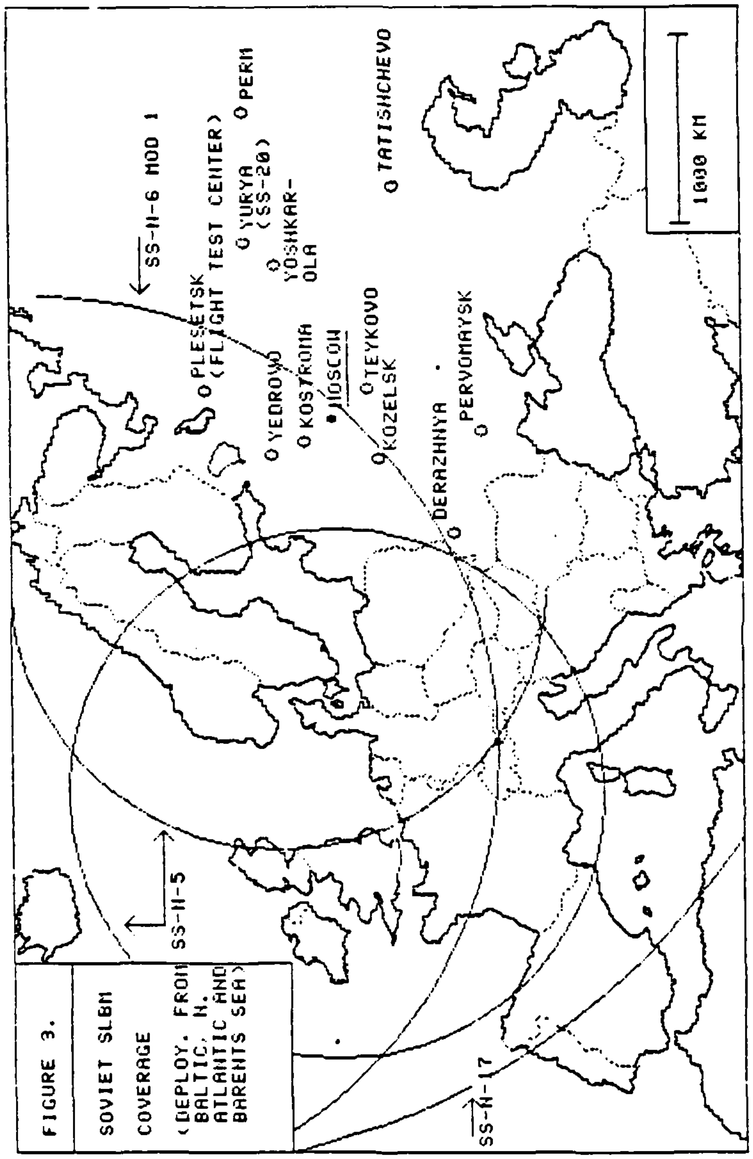


Figure 3. Soviet SLBM Coverage.

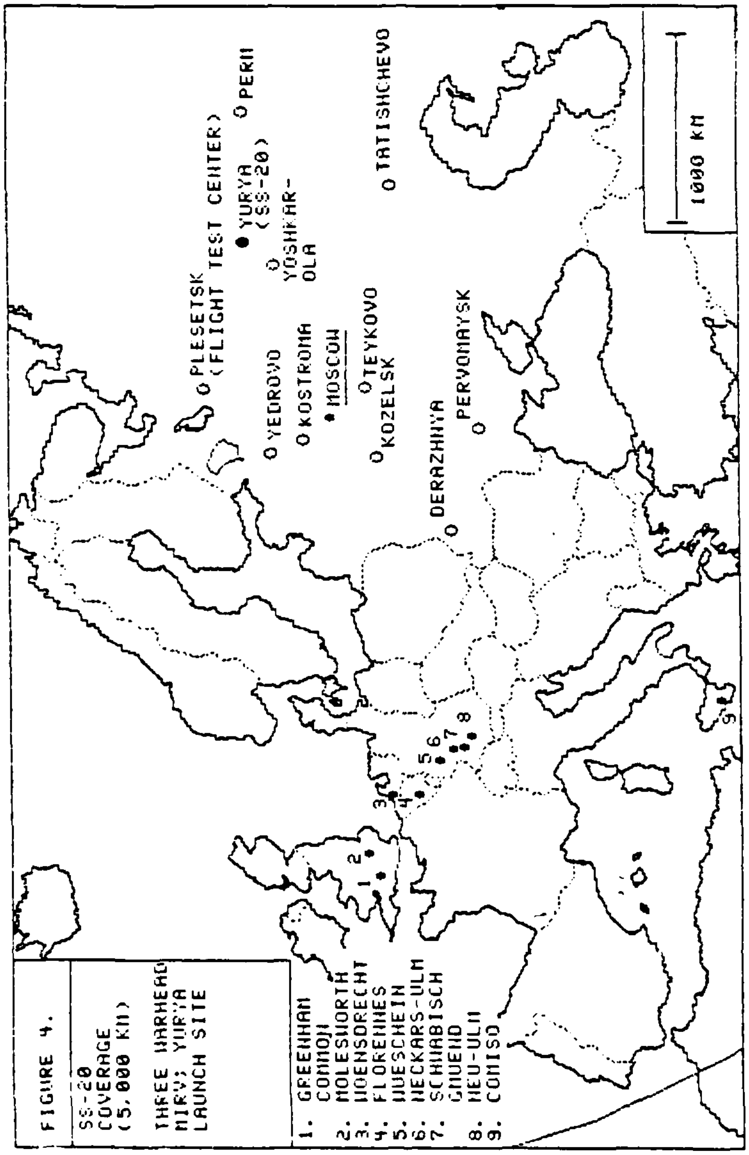


Figure 4. SS-20 Coverage.

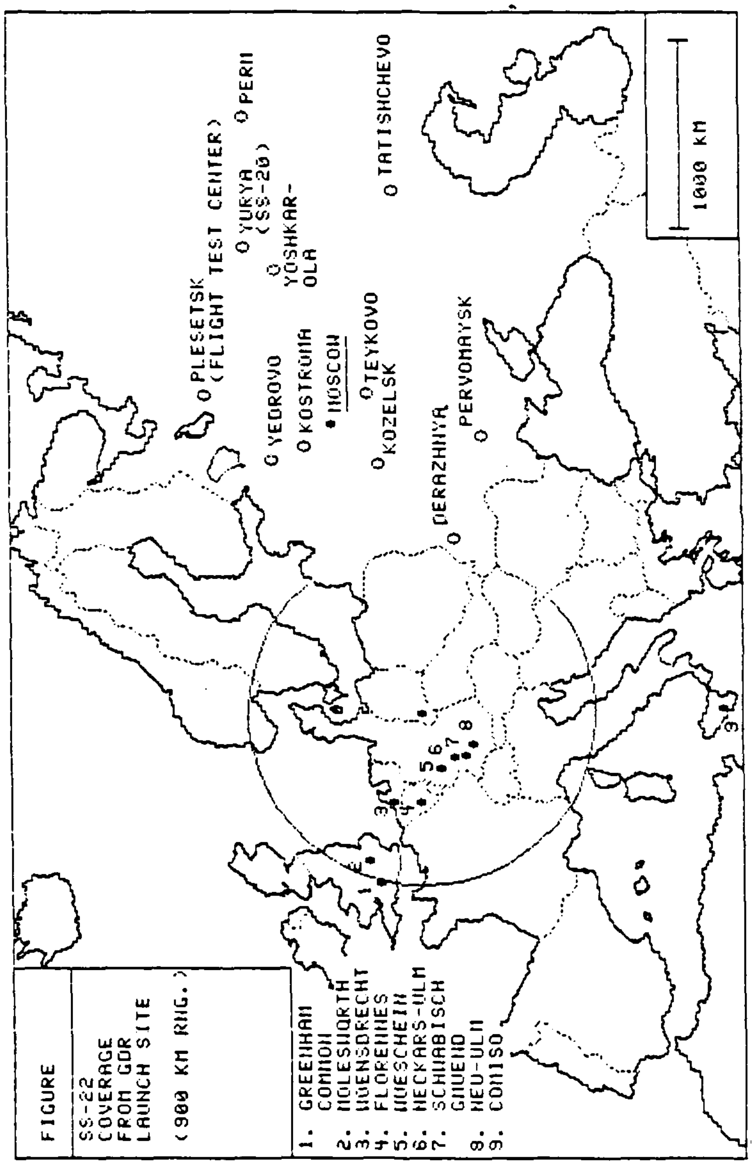


Figure 5. SS-22 Coverage from Central GDR Launch Site.

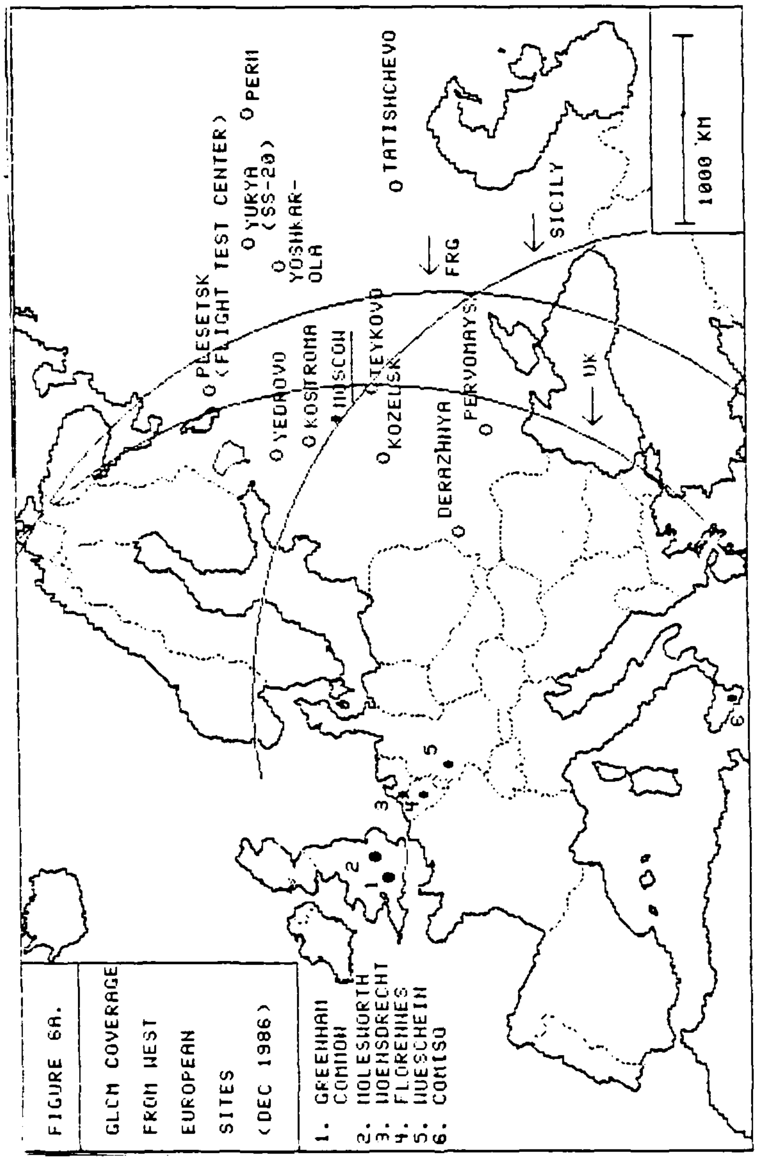


Figure 6a. GLCM Coverage from West European Sites (December 1986).

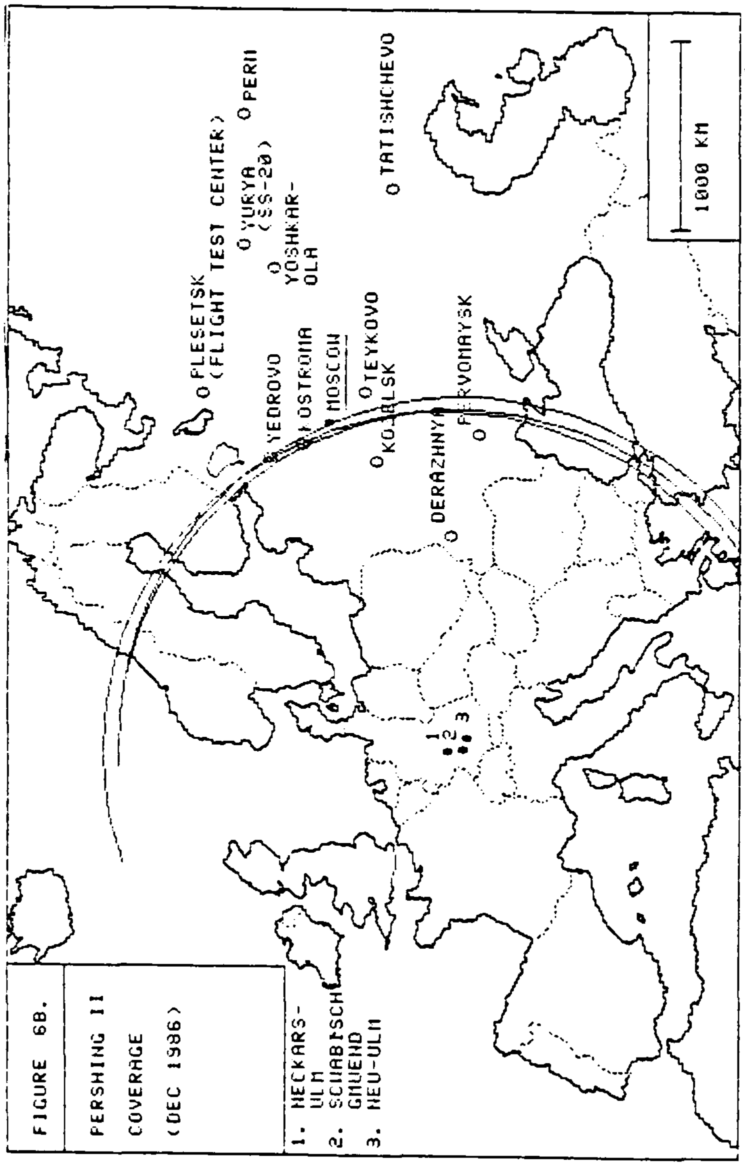


Figure 6b. *Pershing* II Coverage (December 1986).

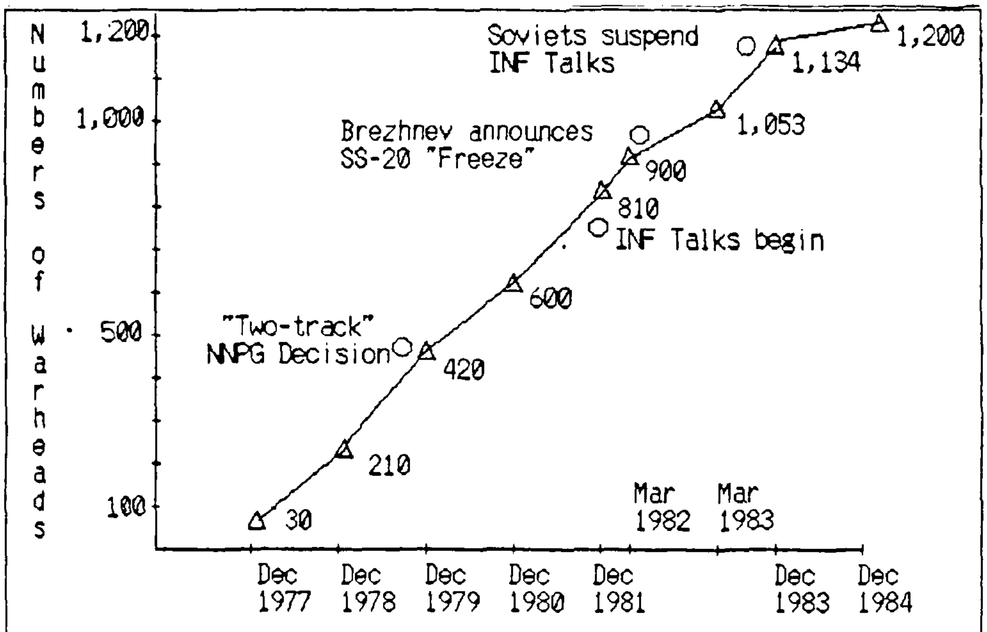


Figure 7. SS-20 Deployment History

Figure 7. SS-2Ø Deployment History.

Analysis: By the above, the U.S. public generally felt that expectations for the expansion of U.S. power (or influence--not necessarily military alone) would either progress or remain the same through this period while the Soviets stood a 5-10% greater likelihood of increasing their power/influence. Contrasting this were the perceptions in Western Europe wherein the populace generally saw *dentente* enduring as evidenced by the large numbers believing the two superpowers would remain equal.

II. <u>European Surveys</u>

A. **West Germany**

"Which side is strongest at the moment (1979), America and the West or Russia and the East* ?"

America and the West	46%
Russia and the East	49
No response	06

"Which side will be strongest in 5 years ? In 10 years ?"

	5 years	10 years
America and the West	42%	33%
Russia and the East	52	56
No response	07	10

*Includes PRC, East Europe, and rest of Communist Bloc

B. **Britain**

"Which side--NATO or Warsaw Pact--has the strongest (1) military and (2) nuclear weapons ?

	Military	Nuclear Weapons
NATO	12%	15%
Russia/Pact	64	54
Both Equal	03	06
Don't Know	21	25

1979

	Increase		Decline		Remain same/don't know*	
United States:						
National:	53%	[61%]	32%	[19%]	15%	[20%]
Sex:						
a. Male	55	[63]	32	[19]	13	[18]
b. Female	51	[59]	33	[19]	16	[22]
Political Affiliation:						
a. Republican	50	[72]	38	[12]	12	[16]
b. Democrat	61	[60]	25	[21]	14	[19]
c. South. Dem.	----	----	----	----	----	----
d. Independent	46	[58]	38	[20]	16	[22]
Trend:						
1979	61	[53]	19	[32]	15	[20]
1978	42	[53]	26	[16]	32	[31]
1977	58	[63]	24	[16]	18	[21]
1976	42	[63]	44	[18]	14	[19]
1974	29	[55]	50	[14]	21	[31]
1969	62	[58]	21	[19]	17	[23]
1968	63	[56]	22	[22]	15	[22]
1967	66	[49]	20	[26]	14	[25]
1966	74	----	14	----	12	----
1965	64	[38]	19	[33]	17	[29]
1960	72	[53]	10	[23]	18	[24]
International:						
West Germany	20	[27]	16	[08]	64	[65]
Britain	31	[48]	23	[08]	46	[44]
France	30	[34]	23	[20]	47	[46]
Italy	----	----	----	----	----	----

*Balance of this category (~55%) = "remain the same."

International:

West Germany	44	[49]	20	[14]	36	[37]
Britain	40	[44]	17	[10]	43	[46]
France	28	[29]	21	[17]	51	[54]
Italy	25	[28]	19	[14]	56	[58]

1978

	Increase		Decline		Remain same/don't know*	
United States:						
National:	42%	[53%]	26%	[16%]	32%	[31%]
Sex:						
a. Male	42	[55]	25	[17]	33	[28]
b. Female	42	[51]	26	[16]	32	[33]
Political Affiliation:						
a. Republican	40	[60]	26	[16]	30	[26]
b. Democrat	47	[50]	22	[19]	31	[31]
c. South. Dem.	52	[57]	22	[14]	26	[29]
d. Independent	38	[54]	27	[13]	35	[33]
Trend:						
1978	42	[53]	26	[16]	32	[31]
1977	58	[63]	24	[16]	18	[21]
1976	42	[63]	44	[18]	14	[19]
1974	29	[55]	50	[14]	21	[31]
1969	62	[58]	21	[19]	17	[23]
1968	63	[56]	22	[22]	15	[22]
1967	66	[49]	20	[26]	14	[25]
1966	74	----	14	----	12	----
1965	64	[38]	19	[33]	17	[29]
1960	72	[53]	10	[23]	18	[24]
International:						
West Germany	26	[33]	12	[08]	52	[59]
Britain	30	[39]	16	[09]	54	[52]
France	27	[23]	19	[20]	54	[57]
Italy	----	----	----	----	----	----

*Balance of this category (~55%) = "remain the same."

APPENDIX D

POLL DATA

During the period surveyed (1977-79) several questions relevant to public perceptions of the relative strengths of the two superpowers were asked of the populaces of the U.S. and West Europe. Presented in this appendix are some of the more topical ones that set the public mood providing the background to the 1979 "Two-Track" decision.

I. Superpower Power/Influence

Which of these do you think is likely to be true of 1977(78/79): A year when America [Russia] will increase her power in the world or a year when power will decline ?

1977

	Increase		Decline		Remain same/don't know	
United States:						
National:	58%	[63%]	24%	[16%]	18%	[21%]
Sex:						
a. Male	60	[66]	25	[16]	15	[18]
b. Female	56	[61]	24	[15]	20	[24]
Political Affiliation:						
a. Republican	57	[71]	28	[14]	15	[15]
b. Democrat	65	[61]	17	[17]	18	[22]
c. South. Dem.	66	[54]	14	[17]	20	[29]
d. Independent	49	[63]	34	[16]	17	[21]
Trend:						
1977	58	[63]	24	[16]	18	[21]
1976	42	[63]	44	[18]	14	[19]
1974	29	[55]	50	[14]	21	[31]
1969	62	[58]	21	[19]	17	[23]
1968	63	[56]	22	[22]	15	[22]
1967	66	[49]	20	[26]	14	[25]
1966	74	----	14	----	12	----
1965	64	[38]	19	[33]	17	[29]
1960	72	[53]	10	[23]	18	[24]

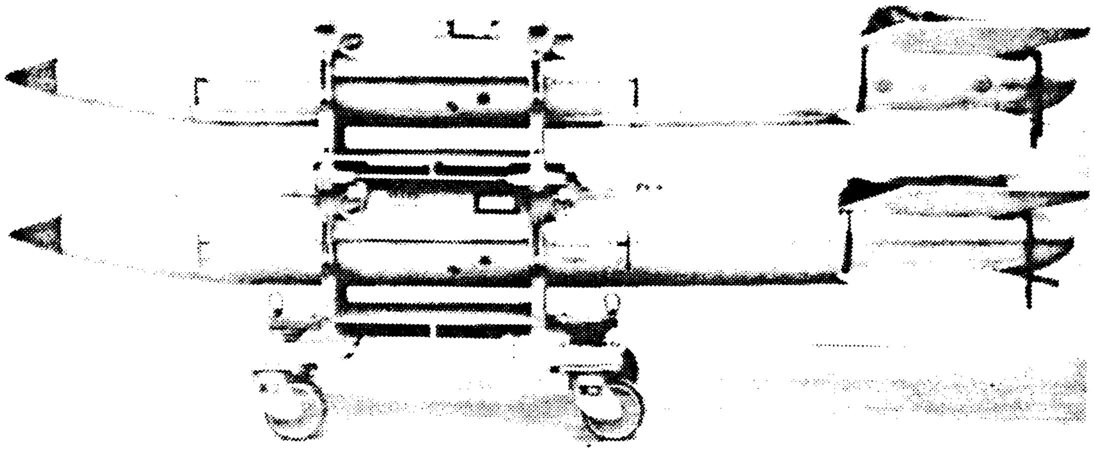


Photo 7. B-61 Tactical Nuclear Bomb.
(Photo courtesy of National Atomic Museum, Albuquerque)

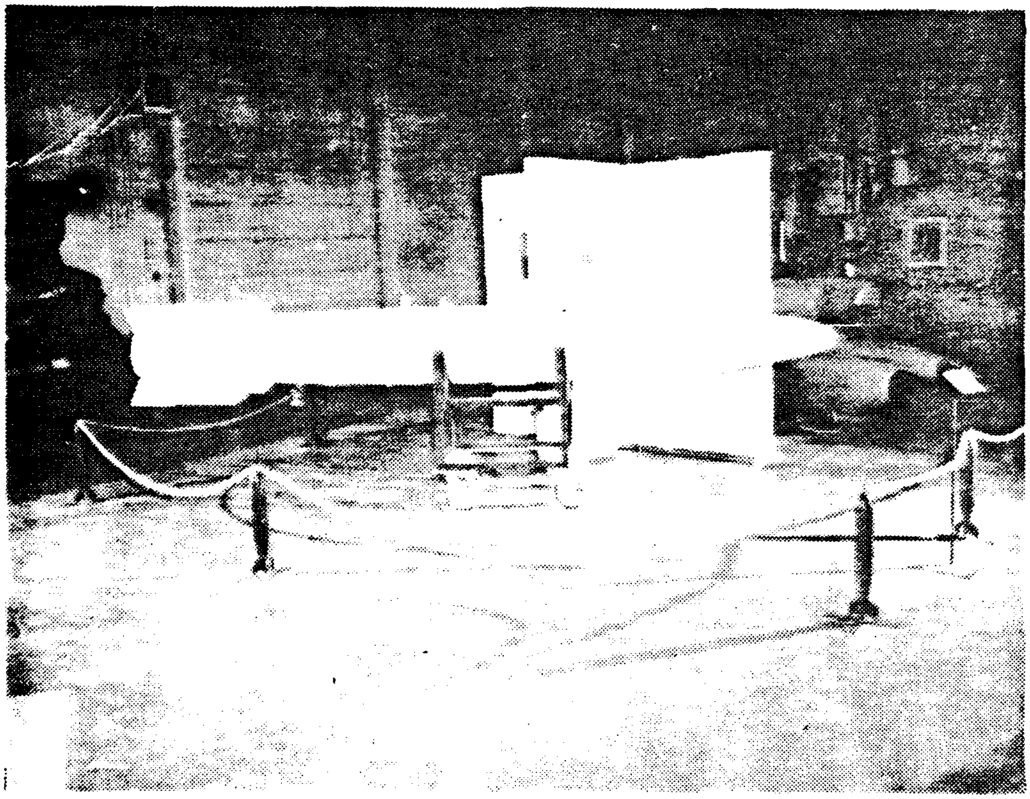


Photo 6. B-43 High Yield (1 MT) Nuclear Bomb.
(Photo courtesy of National Atomic Museum, Albuquerque, N.M.)

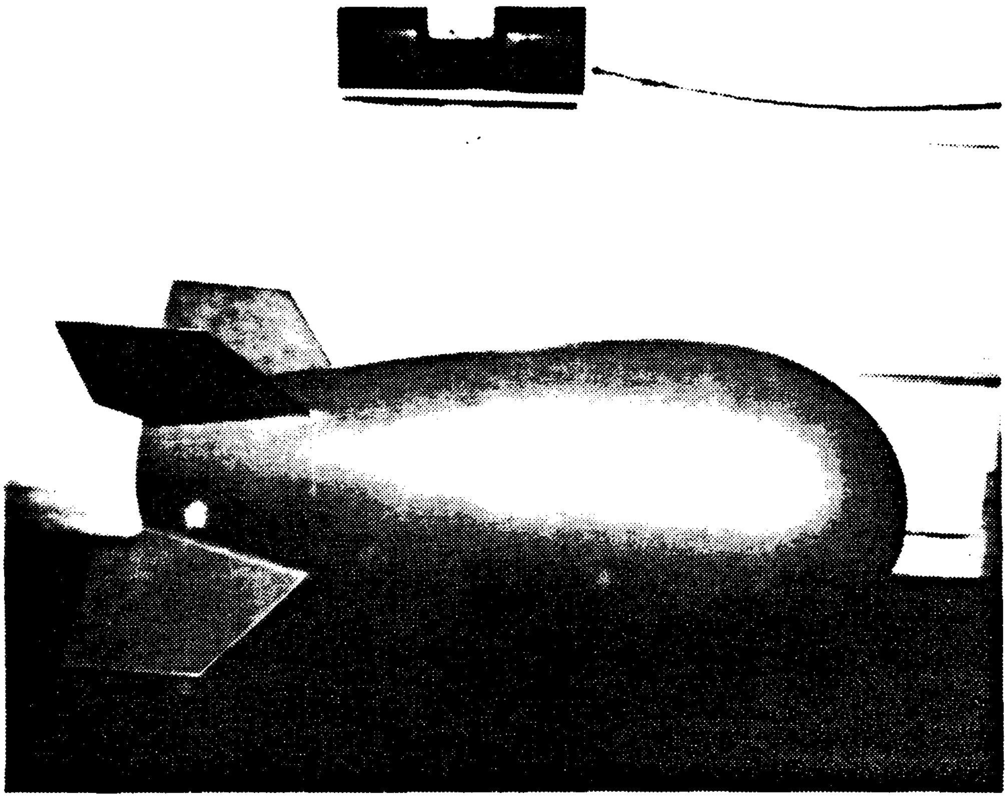


Photo 5. W54-2 *Davy Crockett* Tactical Nuclear Weapon.
(Photo courtesy of National Atomic Museum, Albuquerque, N.M.)

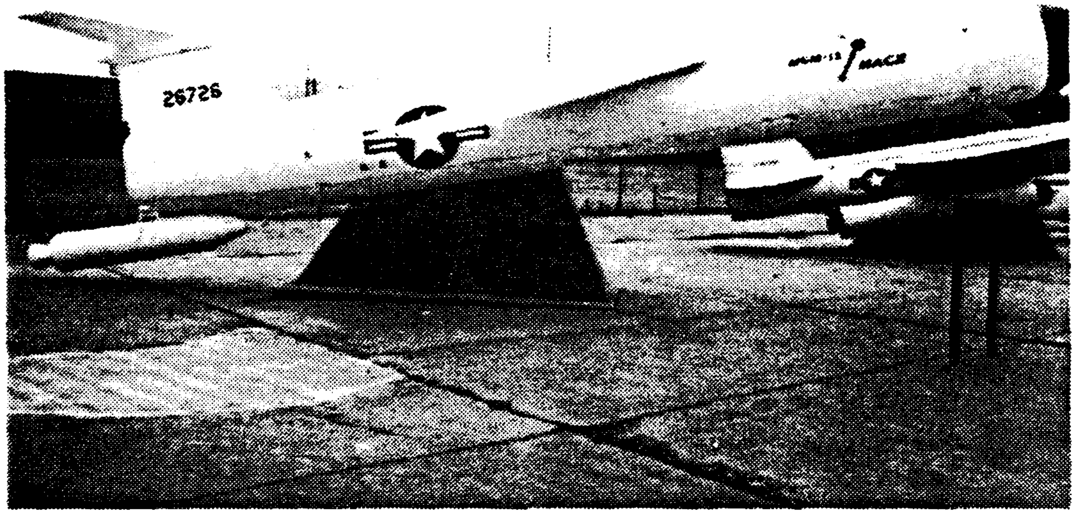


Photo 4. MGM-13 *Mace* Ground Launched Cruise Missile.
(Displayed at National Atomic Museum, Albuquerque, N.M.)

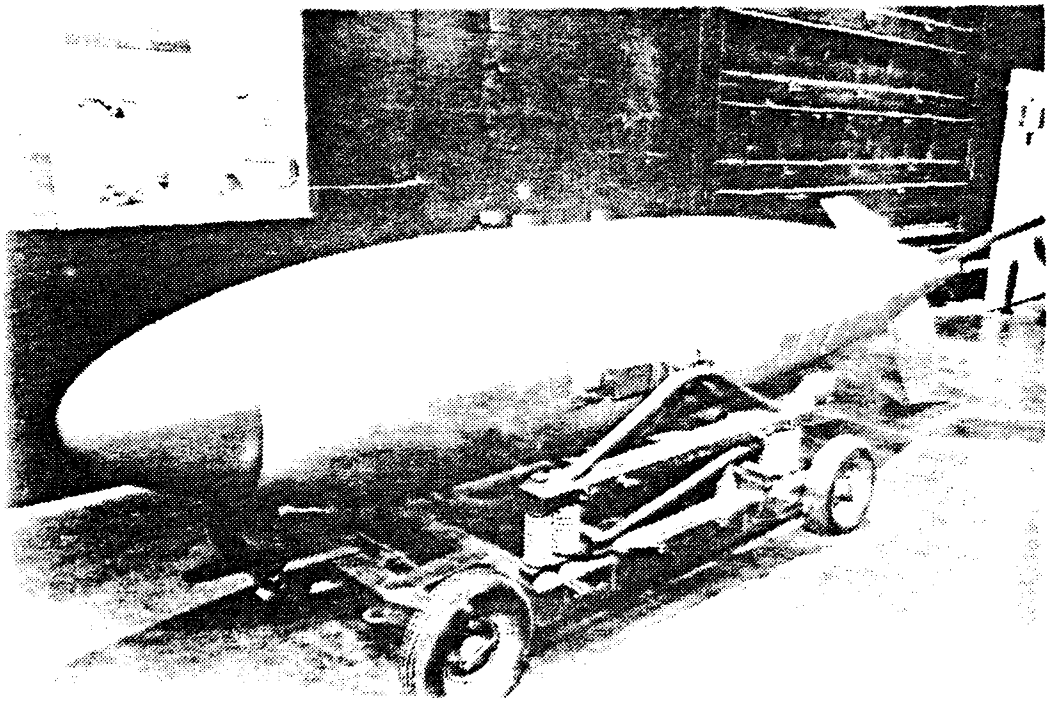


Photo 3. Mk 7 Tactical Atomic Bomb.
(Photo courtesy of National Atomic Museum, Albuquerque, N.M.)

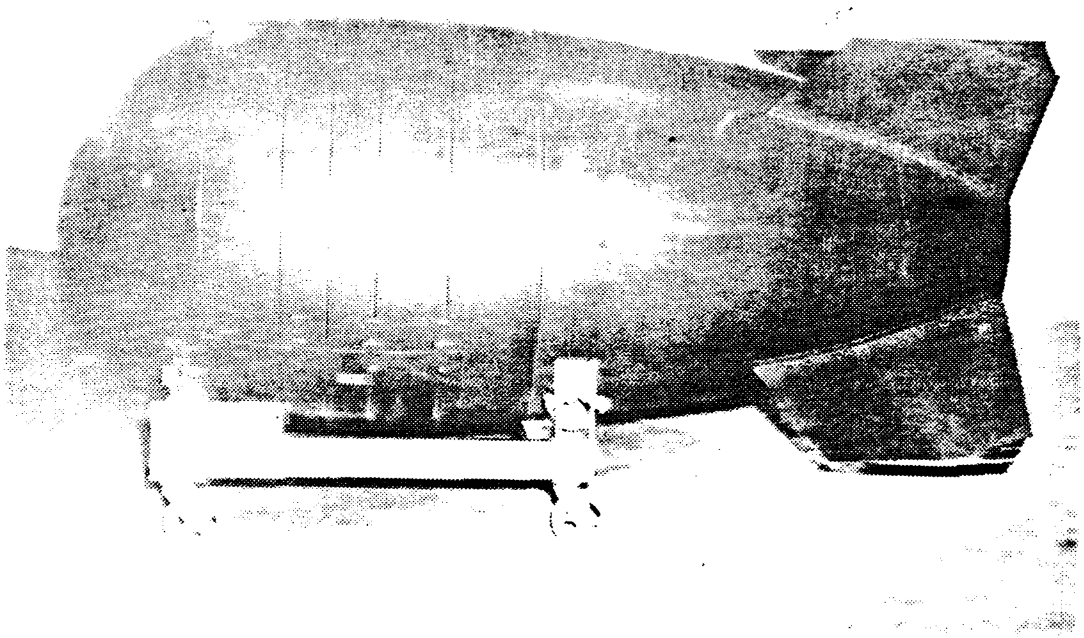


Photo 2. Mk. 6 Atomic Bomb.
(Photo courtesy of National Atomic Museum, Albuquerque, N.M.)

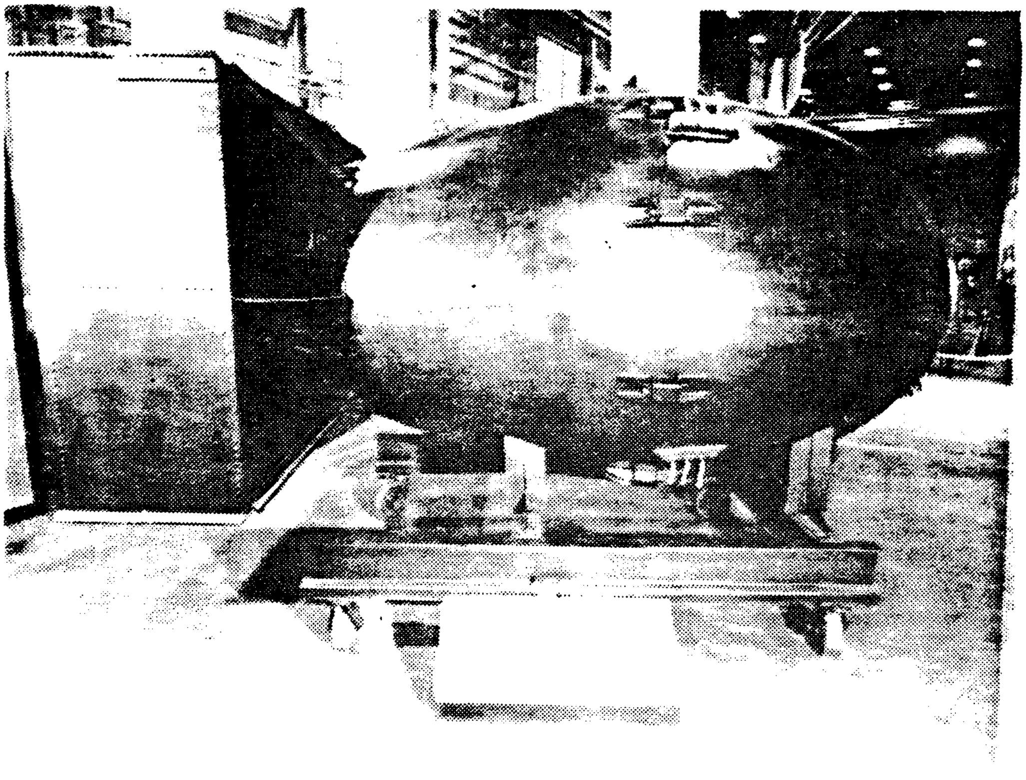


Photo 1. "Fat Man" Atomic Bomb
(Photo courtesy of National Atomic Museum, Albuquerque, N.M.)

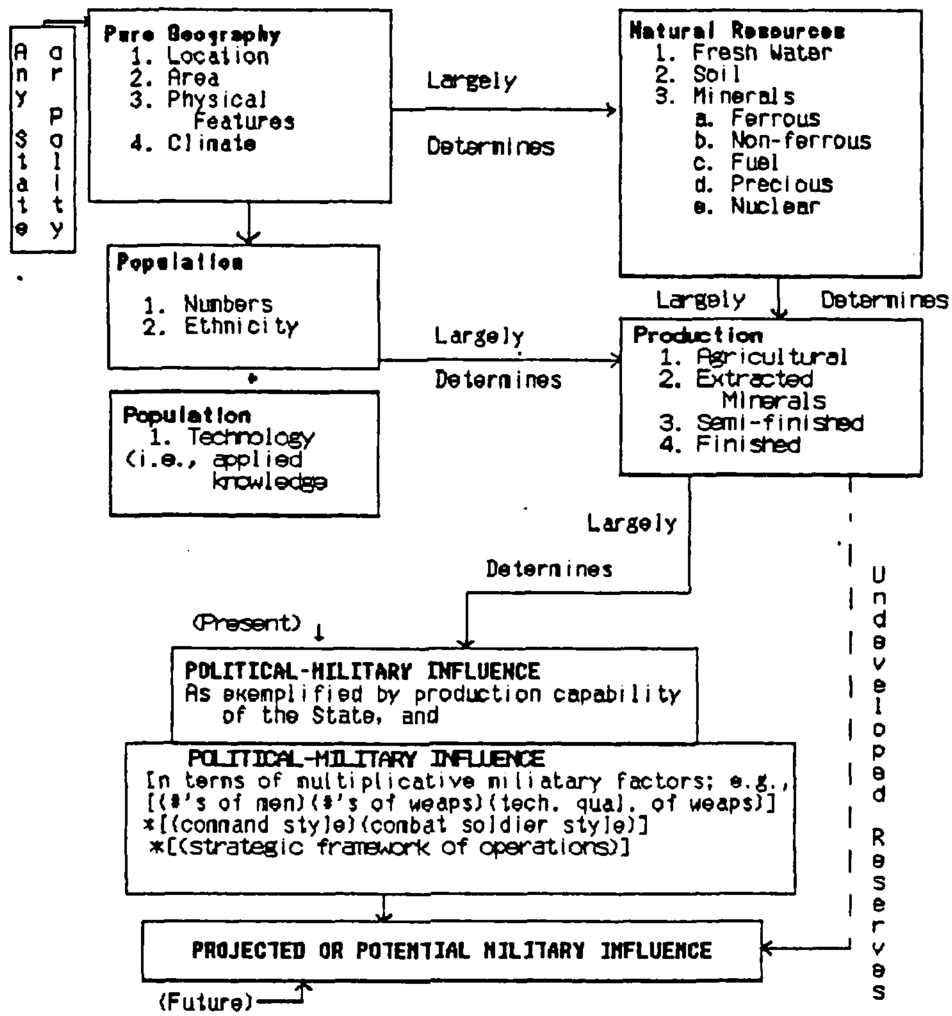


Figure 10. The Strategic Geographic Equation.

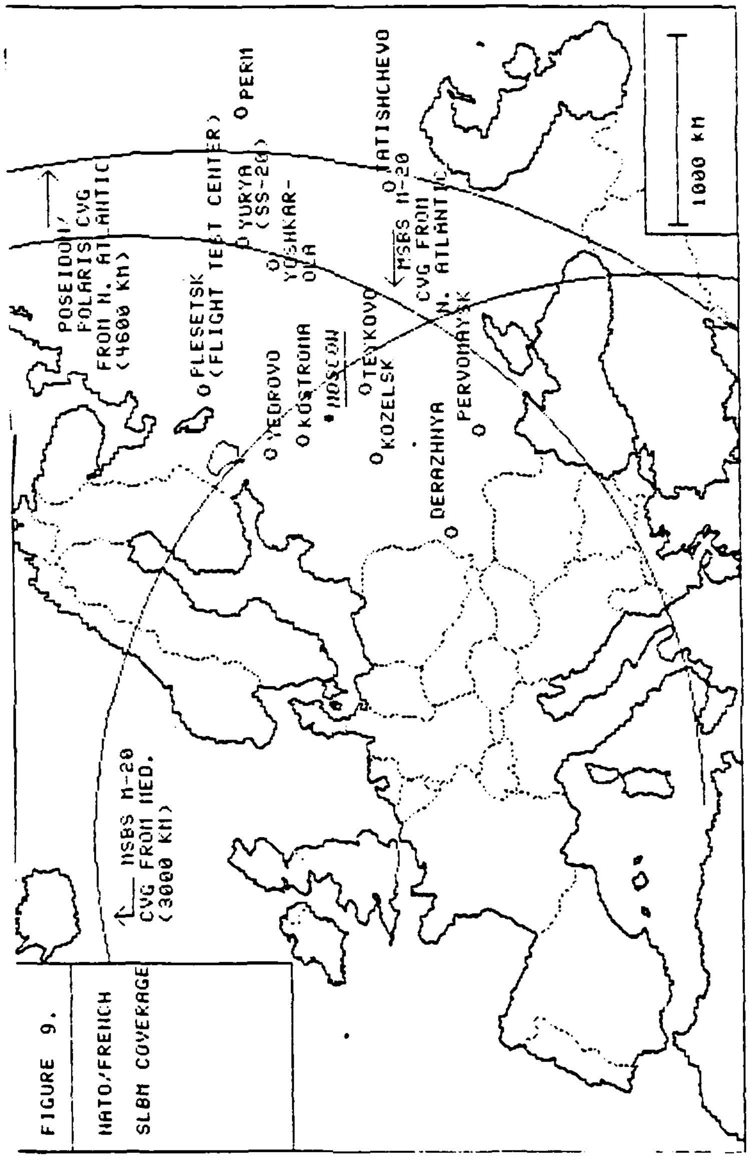


Figure 9. NATO/French SLBM Coverage.

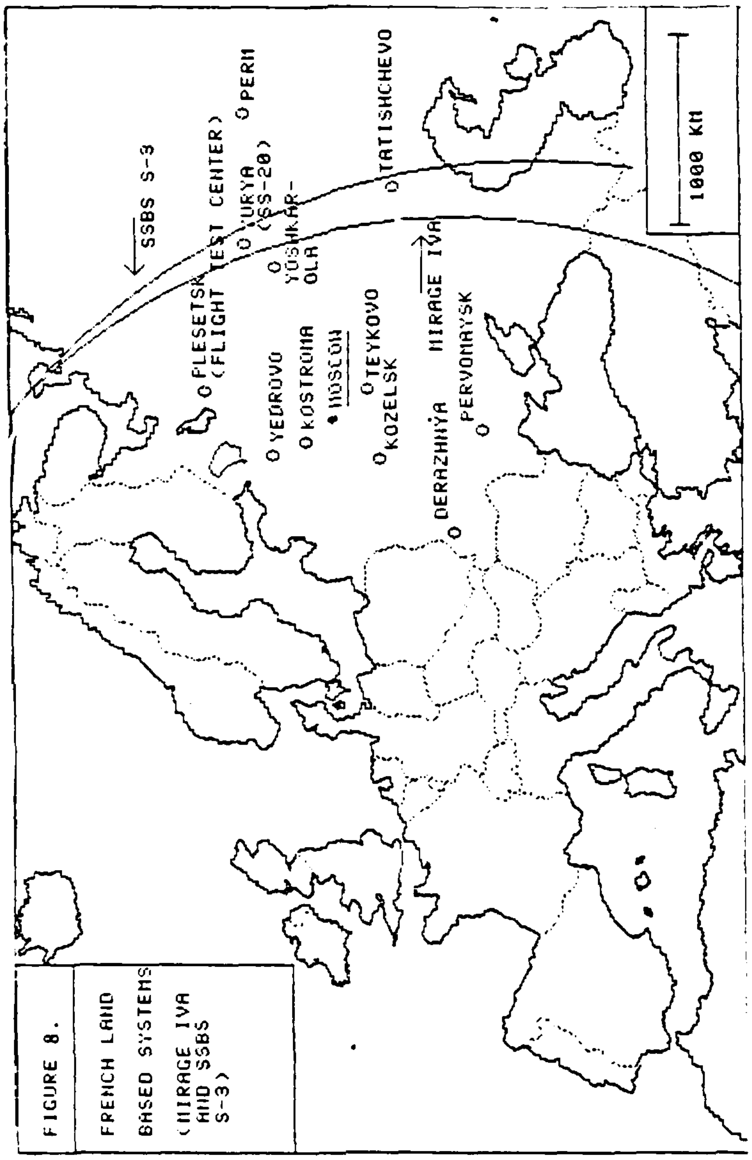


Figure 8. French Land Based Systems.

"What do you think is best for Britain's security--that we do or do not have nuclear weapons here ?

Do	65%
Do not	20
Don't Know	15

C. **Denmark**

"Do you believe there will be another world war within 10 years ?"

	1939 response	1979 response
Yes	45%	17%
No	27	58
Don't Know	28	25

"Are you for or against Denmark's participation in NATO ?"

	1979	1978
For	55%	57%
Against	19	21
Don't Know	26	22

"Do you feel NATO made a right/wrong decision to exchange old/obsolete equipment for new missiles to counter the SS-20 ?"

Right	31%
Wrong	43
Don't Know	26

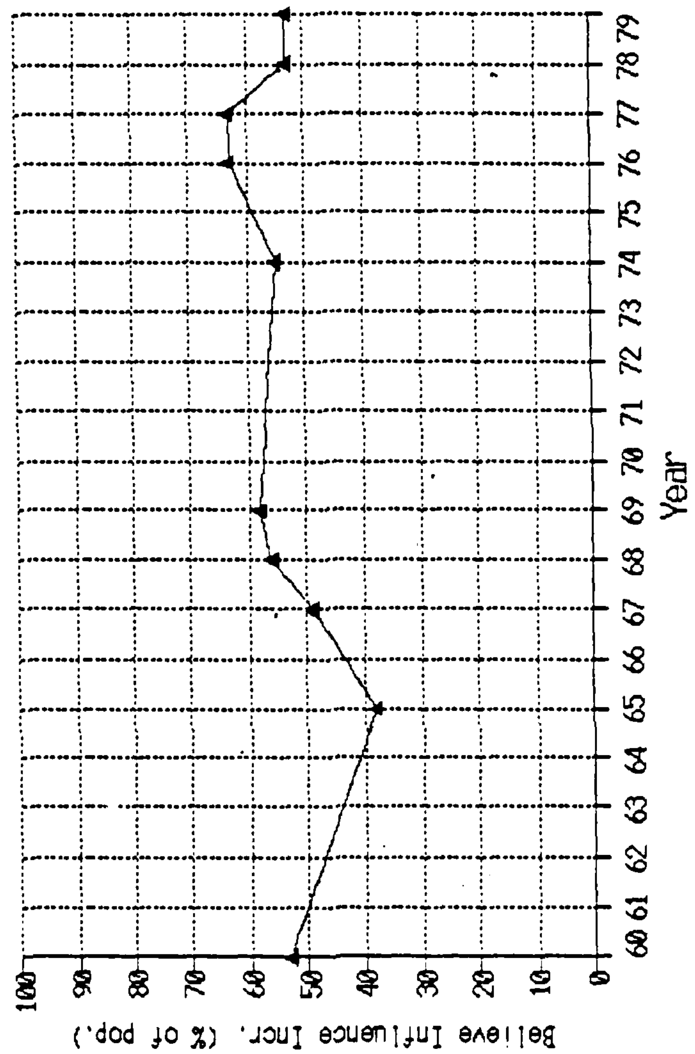
(of those answering right/wrong, 82% had heard or read about the NATO NPG decision)

"With new missiles, are the Soviets/Warsaw Pact better equipped than NATO countries ?"

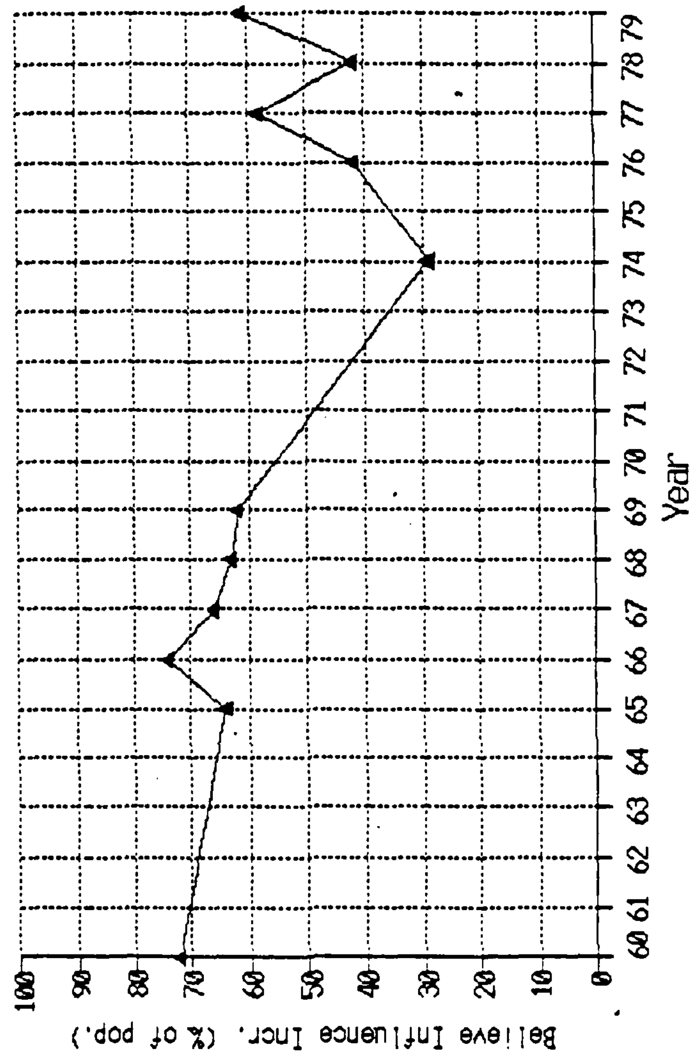
Are better equipped	48%
Are not better equipped	18
Don't know	34

"Would you vote yes or no on NATO deployment of nuclear weapons in Denmark ?"

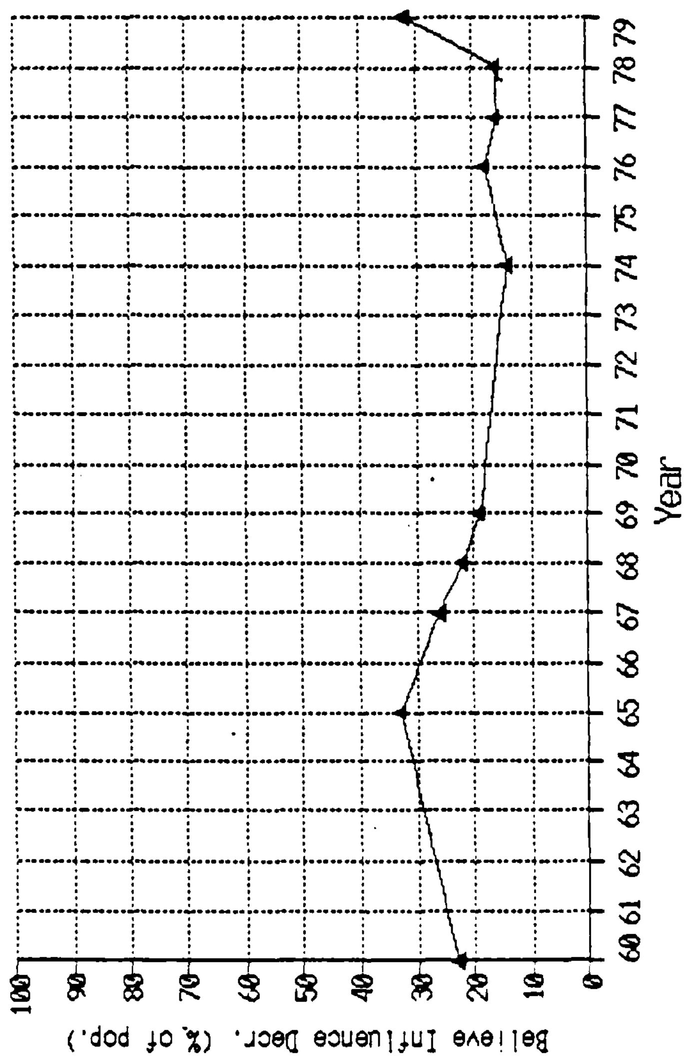
Yes	24%
No	63
Don't Know	13



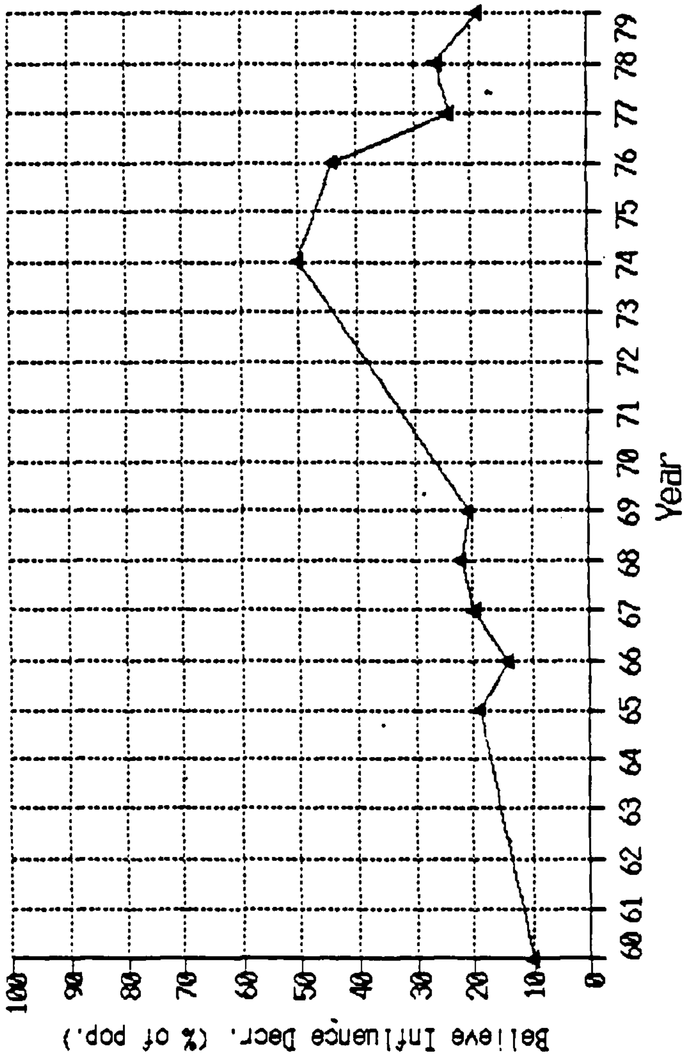
Expectations for Soviet Influence and Power



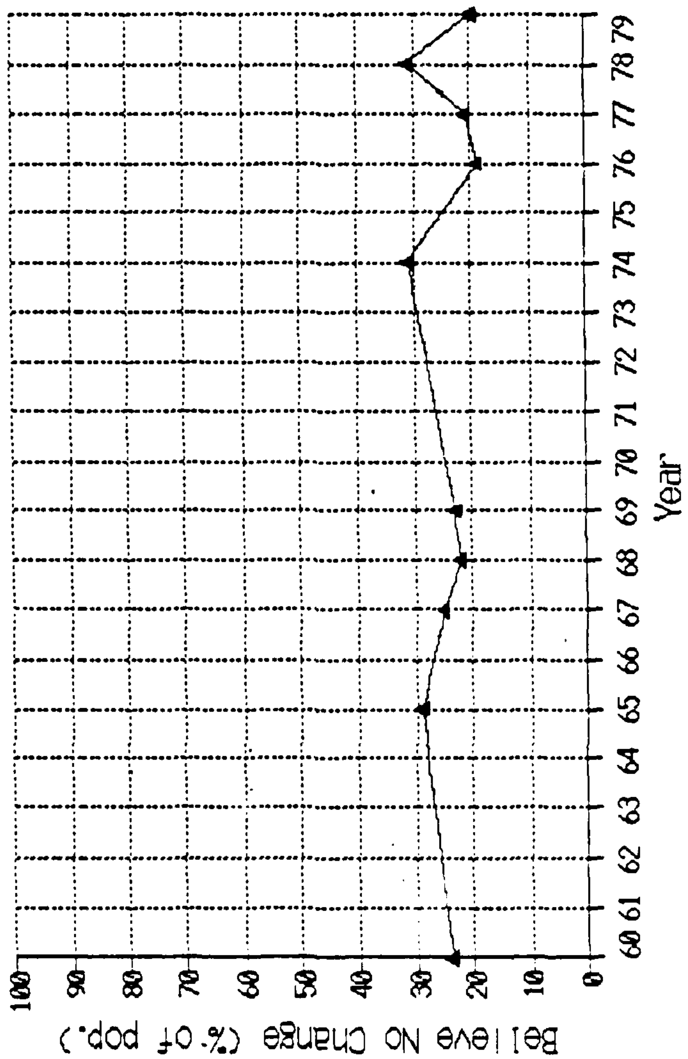
Expectations for U.S. Influence and Power



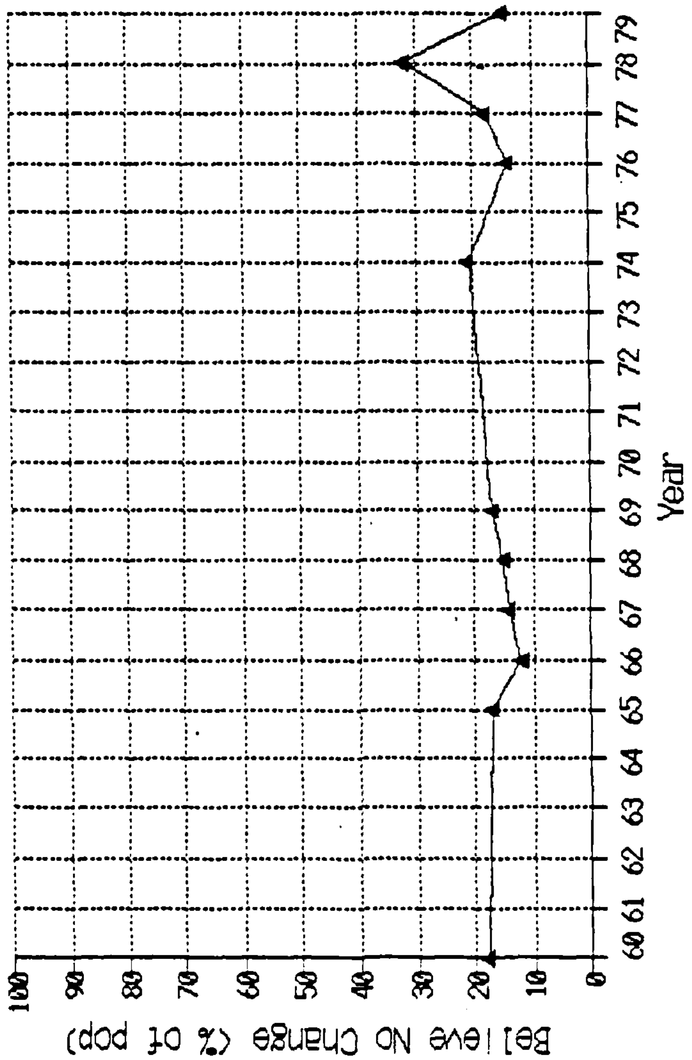
Expectations for Soviet Influence and Power.



Expectations for U.S. Influence and Power.



Expectations for Soviet Influnce and Power.



Expectations for U.S. Influence and Power.

APPENDIX E

THEATER-STRATEGIC NUCLEAR EXCHANGE MODEL

Section

1. Formulas used
2. Assumptions
3. Nuclear systems (listings)
   a. NATO (land-, sea-based)
   b. WTO (land-, sea-based)
   c. NATO and WTO nuclear capable aircraft
4. NATO nuclear system SSKP/TKP's
5. WTO nuclear system SSKP/TKP's
6. Force structure disposition
   a. Levels as of 31 December 1984
   b. Projected levels to December 1987
7. Exchange and post-strike analyses
   a. NATO scen. "A" (Dec 84)
   b. NATO scen. "B" (Dec 84)
   c. NATO scen. "A" (Dec 87)
   d. NATO scen. "B" (Dec 87)
8. Effects of first strike on population
   a. Population loss
   b. Fallout patterns

EQUATIONS USED

1. Counter Military Potential:

$$CMP = \frac{W^{(2/3)}}{(CEP)^2}$$

Where: W = Warhead Yield (MT)

CEP = Circular Error Probable (nm)

2. Single Shot Kill Probability (SSKP):

$$SSKP = 1-\exp^{[-(5.83/H^{0.7})*(cmp)]}$$

3. Overall System Reliability (OAR):

$$OAR = (P_c*P_l)*(P_f*P_g*P_w)*(1-P_a)*(1-P_e)*P_{mirv}$$

Where:

P_c = Countdown Reliability

P_l = Launch Reliability

P_f = Flight and Reentry Reliability

P_g = Guidance Reliability

P_w = Warhead Reliability (e.g., fuzing, etc.)

P_a = Probability of ABM Intercept and Kill on Incoming RV

P_e = Probability of Target Escaping by Launch Prior to Strike by RV

P_{mirv} = Reliability of MIRV Deployment

4. Terminal Kill Probability (TKP):

TKP = SSKP * OAR

5. Cross Targeting on *N* Seperate Missiles: Probability of Kill of Target by One of *N* Missiles (PK_n):

$$PK_n = 1-P_{surv,n} = 1-(1-TKP_1)*...*(1-TKP_n)$$

6. Equivalent Megatonnage (EMT):

$$EMT = (N\ Warheads)*(Indiv.\ Warhead\ Yield)^{2/3}$$

SECTION 2

FIRST STRIKE MODEL ASSUMPTIONS (NATO/SOVIET)[1]

I. Assumptions -- NATO:

A. No Alert

1. IRBM's: not dispersed

a. **GLCM:**

1) UK: one location; 1 flight (16 missiles) in hardened shelter (H= 50 psi), one flight not on alert (H= 10 psi); total of 2 flights (32 missiles)

2) Italy (Sicily): same as for UK

b. ***Pershing* II:** 1 location, 1 battalion of 36 missiles {4 firing batteries}, H= 10 psi (incl. QRA missiles)

c. **SSBS S-3** (France): 18 silos, 18 missiles, H= 200 psi

2. SLBM's:

a. ***Poseidon***: 1 x 16 missiles, deployed, invulnerable

b. ***Polaris* A-3:** 2 x 16 missiles, deployed, invulnerable; remaining (in port) are vulnerable (2 x 16 missiles), H= 30 psi

c. **MSBS M-20** (France): 2 x 16 missiles, deployed, invulnerable; remaining (in port) are vulnerable (3 x 16 missiles), H= 30 psi

---

[1]This model was derived from a series of lectures by Dr. Karlheinz Woehler and Mr. Kerry Kartchner April 13-20, 1984 at the Naval Postgraduate School as part of the course "Nuclear Weapons and Foreign Policy" (NS 3280).

3. Aircraft:

a. **F-111 E/F** QRA: 2 locations with 60 a/c ea.

1) 20% on immediate alert (12 a/c), H= 50 psi
2) 80% on standby alert (48), H= 10 psi

b. ***Mirage* IVA:** 2 locations with 17 a/c ea.

1) 20% on immediate alert (3 a/c), H= 50 psi
2) 80% on standby alert (14 a/c), H= 10 psi

B. Forces Alerted

1. IRBM -- Dispersed:

a. **GLCM:**

1) UK: 2 locations, one flight at each location (16 missiles), H= 10 psi

2) Italy (Sicily): same as for UK

b. ***Pershing* II:** 2 locations, 18 missiles at each location (2 firing batteries of 9 missiles each)

c. **SSBS S-3:** no change

2. SLBM:

a. ***Poseidon*:** no change

b. ***Polaris* A-3:** 3 x 16 invulnerable, 1 x 16 remaining vulnerable

c. **MSBS M-20:** 4 x 16 invulnerable, 1 x 16 vulnerable

3. Aircraft:

a. **F-111:** dispersed -- 10 airfields total; 12 a/c H= 50 psi, 48 a/c H= 10 psi

b. ***Mirage* IVA:** dispersed -- 6 airfields total: 10 a/c H= 50 psi, 24 a/c H= 10 psi

II. Assumptions -- Soviet:

A. SS-20 force used exclusively (all are 3 MIRV vers.)

1. Number available:

a. **NATO scenario "A"** (no alert): 2/3 of total SS-20 force deployed available (those immediately within range of W. Europe) -- 267

b. **NATO scenario "B"** (alerted): full force available -- 400

B. SS-4/-5, SLBM and air breathing forces reserved for followup strikes if necessary

C. TARGETING:

1. See schematic for targeting on individual systems

2. **Goals:** (1) destruction of 60-70% of NATO's theater-strategic force [variation incl. France], (2) low collateral damage

D. Full system availability, launch from pre-surveyed sites

E. NATO C^3 not targeted unless co-located with TNF sites (e.g., GLCM LCC's)

Mindful of the simplified nature of this model, there were certain other variables present with nuclear exchanges that were not included here. That does not mean they are to be wholly discounted though. Among these is the effectiveness of NATO and French systems against the improving ABM system in the Central Strategic Region and centered on Moscow. As this system receives continued upgrades in the form of new battle management radars, interceptor missiles, etc. the ability of such systems as the *Pershing* II, MSBS M-20, and *Polaris* to penetrate this defensive ring (even with penetration aids in the case of the latter two) becomes more suspect. Additionally, the fielding of the highly

capable SA-10 SAM and deployment of the MiG-31 *Foxhound* will lower the probability of cruise missiles' ability to penetrate Soviet airspace to strike targets in the Soviet Union.

As for aircraft (e.g., F-111's), while the model shows a certain number surviving the first strike, it does not take into consideration the possibility of runway destruction and nuclear effects on aircrew and ground personel or equipment degradation. The same might be said for in port SSBN's as well.

Finally, the Soviets would not restrict themselves solely to use of SS-20's. More likely a wide range of attempts ranging from *Spetznaz* to conventional and nuclear weapons would be used. The primary reason for the approach taken is to illustrate certain points made within the main body of the thesis with regards to NATO and Soviet theater-strategic systems and deployments.

SS-2Ø TARGETING SCHEMATICS

I. SYMBOLOGY

NATO (H = 1Ø psi):

NATO (H = 5Ø psi):

French (H = 1Ø psi):

French (H = 5Ø psi/2ØØ psi [SSBS S-3 only]):

SS-2Ø (1 missile/3 MIRV warhead):

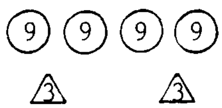
II. NATO SCENARIO "A" (December 1984 Force Levels):

A. GLCM (#'s = #'s of missiles)

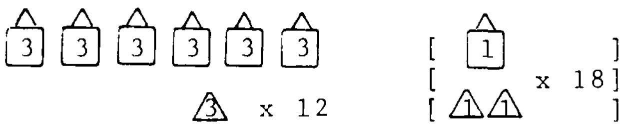
UK **Italy**

B. *Pershing II* (#'s = #'s of missiles)

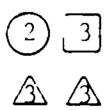
FRG (one location)



C. SSBS S-3 (#'s = #'s of missiles)



D. In Port SSBN's (#'s = #'s of SSBN's; missiles = # x 16)



THEATER-TACTICAL

Land based

***Pershing* 1A:**

CMP= 11.33 OAR= 0.723

SSKP: TKP:

$SSKP_1$= 1.0	$SSKP_4$= 0.928	TKP_1= 0.723	TKP_4= 0.671
$SSKP_2$= 1.0	$SSKP_5$= 0.802	TKP_2= 0.723	TKP_5= 0.580
$SSKP_3$= 0.99	$SSKP_6$= 0.705	TKP_3= 0.713	TKP_6= 0.510

***Lance*:**

CMP= 3.24 OAR= 0.723

SSKP: TKP:

$SSKP_1$= 0.998	$SSKP_4$= 0.529	TKP_1= 0.722	TKP_4= 0.529
$SSKP_2$= 0.998	$SSKP_5$= 0.371	TKP_2= 0.722	TKP_5= 0.268
$SSKP_3$= 0.705	$SSKP_6$= 0.294	TKP_3= 0.510	TKP_6= 0.213

***Honest John* (Greece and Turkey):**

CMP= 0.07 OAR= 0.723 (may be as low as 0.216 given age of system)

SSKP: TKP:

$SSKP_1$= 0.12	$SSKP_4$= 0.016	TKP_1= 0.09	TKP_4= 0.012
$SSKP_2$= 0.12	$SSKP_5$= 0.010	TKP_2= 0.09	TKP_5= 0.007
$SSKP_3$= 0.03	$SSKP_6$= 0.008	TKP_3= 0.02	TKP_6= 0.006

***Pluton* (France):**

CMP= 3.19 OAR= 0.723

SSKP: TKP:

$SSKP_1$= 0.99	$SSKP_4$= 0.523	TKP_1= 0.722	TKP_4= 0.378
$SSKP_2$= 0.99	$SSKP_5$= 0.366	TKP_2= 0.722	TKP_5= 0.265
$SSKP_3$= 0.70	$SSKP_6$= 0.291	TKP_3= 0.506	TKP_6= 0.210

Land based

***Pershing* II:**

CMP= 531.22 OAR_{mirv}= 0.723

SSKP: TKP:

$SSKP_1$= 1.0	$SSKP_4$= 1.0	TKP_1= 0.723	TKP_4= 0.723
$SSKP_2$= 1.0	$SSKP_5$= 1.0	TKP_2= 0.723	TKP_5= 0.723
$SSKP_3$= 1.0	$SSKP_6$= 1.0	TKP_3= 0.723	TKP_6= 0.723

GLCM:

CMP= 531.22 OAR= 0.615

SSKP: TKP:

$SSKP_1$= 1.0	$SSKP_4$= 1.0	TKP_1= 0.615	TKP_4= 0.615
$SSKP_2$= 1.0	$SSKP_5$= 1.0	TKP_2= 0.615	TKP_5= 0.615
$SSKP_3$= 1.0	$SSKP_6$= 1.0	TKP_3= 0.615	TKP_6= 0.615

SSBS S-3 (France):

CMP= 6.25 OAR= 0.723

SSKP: TKP:

$SSKP_1$= 1.0	$SSKP_4$= 0.766	TKP_1= 0.723	TKP_4= 0.554
$SSKP_2$= 1.0	$SSKP_5$= 0.591	TKP_2= 0.723	TKP_5= 0.427
$SSKP_3$= 0.91	$SSKP_6$= 0.490	TKP_3= 0.654	TKP_6= 0.354

THEATER-STRATEGIC

Sea based

***Poseidon* C-3:**

CMP = 22.47 OAR_{mirv}=0.651

SSKP: TKP:

$SSKP_1$= 1.0	$SSKP_4$= .995	TKP_1= 0.65	TKP_4= 0.648
$SSKP_2$= 1.0	$SSKP_5$= .960	TKP_2= 0.65	TKP_5= 0.625
$SSKP_3$= 1.0	$SSKP_6$= .911	TKP_3= 0.65	TKP_6= 0.593

***Polaris* A-3 (w/*Chevaline* warhead):**

CMP= 7.99 OAR_{mirv}= 0.651

SSKP: TKP:

$SSKP_1$= 1.0	$SSKP_4$= 0.843	TKP_1= 0.651	TKP_4= 0.549
$SSKP_2$= 1.0	$SSKP_5$= 0.681	TKP_2= 0.651	TKP_5= 0.443
$SSKP_3$= 0.95	$SSKP_6$= 0.577	TKP_3= 0.619	TKP_6= 0.376

MSBS M-20 (France):

CMP= 3.89 OAR_{mirv}= 0.723

SSKP: TKP:

$SSKP_1$= 1.0	$SSKP_4$= 0.843	TKP_1= 0.651	TKP_4= 0.549
$SSKP_2$= 1.0	$SSKP_5$= 0.681	TKP_2= 0.651	TKP_5= 0.443
$SSKP_3$= 0.95	$SSKP_6$= 0.577	TKP_3= 0.619	TKP_6= 0.376

SECTION 4

NATO NUCLEAR SYSTEM TKP's

Assumptions:

A. Hardness:

H_1= 5 psi H_4= 100 psi

H_2= 10 psi H_5= 200 psi

H_3= 50 psi H_6= 300 psi

H_1 corresponds to $SSKP_1$, etc.

B. OAR:

OAR_{single}:

P_c= 0.9

P_1= 0.9

P_f= 0.95

P_g= 0.95

P_w= 0.99

P_a= 0 (except for GLCM/SLCM where P_a= 0.15)

P_e= 0

OAR_{mirv}:

same as above except that P_{mirv}= 0.9

- ABM systems (e.g. Moscow complex) are not counted although they may conceivably be effective against some theater-strategic systems.

NUCLEAR SYSTEMS (Aircraft-Europe)	System Name	Number Deployed (12/83)	Number of Warheads	Yield (MT)	Range (km)	CEP (nm)	Equivalent Megatonnage EMT = ny^.666	Counter Military Potential CMP = EMT/CEP^2
NATO:								
A. USA								
1. LONG RANGE	F-111 E/F	120	2	1	4700	.10	2.00	200.00
2. MEDIUM RANGE								
(+ CV based A/C)	F-4E Phantom	96	2	1	2200	.10	2.00	200.00
	F-16 Falcon	144	1	1	3800	.05	1.00	400.00
	A-6E Intruder	30	2	1	1810	.10	2.00	200.00
	A-7E Corsair II	72	2	1	1000	.10	2.00	200.00
	F/A-18 Hornet	24	2	1	645	.05	2.00	800.00
B. NON-US								
1. MEDIUM RANGE								
a. Britain	Tornado	80	2	1	2800	.05	2.00	800.00
b. Belg/Neth.	F-16 Falcon	90	1	1	3800	.05	1.00	400.00
c. FRG, Greece	F-4E Phantom	142	2	1	2200	.10	2.00	200.00
d. France	Mirage IVA	34	1	.06	3200	.10	.15	15.35
	Mirage IIIE	30	2	.015	2400	.10	.12	12.20
(Carrier based)	Super Etendard	36	2	.015	1500	.10	.12	12.15
WTO								
1. LONG RANGE								
	Tu-95 Bear B/C	100	1	1	12800	1.00	1.00	1.00
	Tu-22M Backfire	210	2	1	8000	.05	2.00	800.00
2. MEDIUM RANGE								
	Tu-22 Blinder	165	2	1	4000	.10	2.00	200.00
	Tu-16 Badger	40	2	1	4800	.10	2.00	200.00
	Su-24 Fencer	800	2	1	4000	.05	2.00	800.00
	MiG-27 Flogger D	650	1	1	1400	.10	1.00	100.00
	Su-17 Fitter D/H	650	1	1	1800	.10	1.00	100.00

(Note: CEP's estimated except for Bear B/C [AS-3 CEP])

NATO/WTO Nuclear Capable Aircraft

NUCLEAR SYSTEMS (Europe)	System Name	Number Deployed (12/83)	Number of Warheads	Yield (MT)	Range (km)	CEP (nm)	Equivalent Megatonnage EMT = ny^.666	Counter Military Potential CMP = EMT/CEP^2
Warsaw Pact								
a. Soviet Union								
1. SLBM's	SS-N-5	48	1	1	1400	1.53	1.00	.42
	SS-N-6 Mod 1	384	1	1	2400	.49	1.00	4.11
	SS-N-17	12	1	1	3900	.77	1.00	1.69
2. Intermediate (MR/IRBM's)	SS-4	223	1	1	2000	1.26	1.00	.63
	SS-5	0	1	1	4100	.60	1.00	2.75
	SS-20	450	3	.15	5000	.11	.85	70.08
3. Tactical (SRBM)	FROG-7	440	1	.2	70	.22	.34	7.14
	SS-12	70	1	.2	900	.49	.34	1.41
	SS-21	62	1	.2	120	.16	.34	12.73
	SS-22	100	1	.5	900	.16	.63	23.43
	SS-23	10	1	.2	500	.16	.34	13.37
(GLCM)	SS-C-1b Sepal	100	1	.35	450	.40	.58	3.11
	SS-CX-4	devl.	1	.2	3000	.04	.34	213.98
(SLCM)	SS-N-12	80	1	.35	1000	.40	.58	3.11
	SS-NX-21	devl.	1	.2	3000	.04	.34	213.98
(ALCM)	AS-3 Kangaroo	70	1	1	650	1.00	1.00	1.60
	AS-X-15	devl.	1	.2	3000	.04	.34	213.98
(Artillery)	S-23 180mm	168	1	.002	30	.10	.02	1.59
b. non-Soviet								
(SRBM)	SS-1 Scud B/C	137	1	.2	450	1.50	.34	.15
	FROG-3/-5/-7	198	1	.2	60	.21	.34	7.91

WTO Nuclear Systems (DEC 86)

NUCLEAR SYSTEMS (Europe)	System Name	Number Deployed (12/83)	Number of Warheads	Yield (MT)	Range (km)	CEP (nm)	Equivalent Megatonnage EMT = nY^.666	Counter Military Potential CMP = EMT/CEP^2
Warsaw Pact								
a. Soviet Union								
1. SLBM's	SS-N-5	48	1	1	1400	1.53	1.00	.42
	SS-N-6 Mod 1	384	1	1	2400	.49	1.00	4.11
	SS-N-17	12	1	1	3900	.77	1.00	1.69
2. Intermediate (MR/IRBM's)	SS-4	223	1	1	2000	1.26	1.00	.63
	SS-5	16	1	1	4100	.60	1.00	2.75
	SS-20	400	3	.15	5000	.11	.85	70.08
3. Tactical (SRBM)	FROG-7	440	1	.2	70	.22	.34	7.14
	SS-12	70	1	.2	900	.49	.34	1.41
	SS-21	62	1	.2	120	.16	.34	12.73
	SS-22	100	1	.5	900	.16	.63	23.43
	SS-23	10	1	.2	500	.16	.34	13.77
(GLCM)	SS-C-1b	100	1	.35	450	.40	.50	3.11
	SS-CX-4	devl.	1	.2	3000	.04	.34	213.98
(SLCM)	SS-N-12	80	1	.35	1000	.40	.50	3.11
	SS-NX-21	devl.	1	.2	3000	.04	.34	213.96
(ALCM)	AS-3 Kangaroo	70	1	1	650	1.00	1.00	1.00
	AS-X-15	devl.	1	.2	3000	.04	.34	213.93
(Artillery)	S-23 180mm	168	1	.002	30	.10	.02	1.59
b. non-Soviet								
(SRBM)	SS-1 Scud B/C	137	1	.2	450	1.50	.34	.15
	FROG-3/-5/-7	198	1	.2	60	.21	.34	7.91

WTO Nuclear Systems (DEC 84)

NUCLEAR SYSTEMS (Europe)	System Name	Number Deployed (12/83)	Number of Warheads	Yield (MT)	Range (km)	CEP (nm)	Equivalent Megatonnage EMT = ny^.666	Counter Military Potential CMP = EMT/CEP^2
NATO:								
a. US								
1. SLBM's	Poseidon C-3	16	10	.05	4600	.25	1.36	22.47
2. Intermediate (MR/IRBM's)	Pershing II	108	1	.05	1800	.02	.14	531.22
	GLCM	464	1	.05	2500	.02	.14	531.22
3. Tactical (SRBM's, etc.)	Pershing 1A	0	1	.4	720	.22	.54	11.33
	Lance	36	1	.05	125	.21	.14	3.24
	SLCM	44	1	.25	2400	.02	.40	1551.63
	M-110 203mm*	200	1	.002	21	.09	.02	1.84
	(two vers.)	200	1	.0005	21	.09	.01	.73
	M-109 155mm*	252	1	.002	18	n.a.	.02	n.a.
	(two vers.)	252	1	.0005	18	n.a.	.01	n.a.
b. non-US								
1. SLBM's								
a) Britain	Polaris A-3	64	6	.2	4600	.51	2.05	7.99
b) France	MSBS M-20	80	1	1	3000	.51	1.00	3.89
2. Intermediate (MR/IRBM's)								
a) France	SSBS S-3	18	1	1	3500	.40	1.00	6.25
3. Tactical								
a) Greece, Turkey	Honest John	54	1	.02	40	1.02	.07	.07
b) West Germany	Pershing 1A	72	1	.4	720	.22	.54	11.33
c) France	Pluton	42	1	.025	120	.16	.09	3.19
d) Belgium, FRG, Britain, Italy, Netherlands	Lance	56	1	.05	110	.21	.14	3.24
a) Multiple non-U.S. NATO mbrs.	M-110 203mm*	200	1	.002	21	.09	.02	1.84
	(two vers.)	200	1	.0005	21	.09	.01	.73
a) Multiple non-U.S. NATO mbrs.	M-109 155mm*	252	1	.002	18	n.a.	.02	n.a.
	(two vers.)	252	1	.0005	18	n.a.	.01	n.a.

* : +5,000 nuclear artillery shells deployed in Europe (Incl. France)

SECTION 3

Nuclear Systems (listings)

NUCLEAR SYSTEMS (Europe)	System Name	Number Deployed (12/83)	Number of Warheads	Yield (MT)	Range (km)	CEP (nm)	Equivalent Megatonnage EMT = n·Y^.666	Counter Military Potential CMP = EMT/CEP^2
NATO:								
a. US								
1. SLBM's	Poseidon C-3	16	10	.05	4600	.25	1.36	22.47
2. Intermediate (MR/IRBM's)	Pershing II	36	1	.05	1800	.02	.14	531.22
	GLCM	64	1	.05	2500	.02	.14	531.22
3. Tactical (SRBM's, etc.)	Pershing 1A	72	1	.4	720	.22	.54	11.33
	Lance	36	1	.05	125	.21	.14	3.24
	SLCM	44	1	.25	2400	.02	.40	1551.60
	M-110 203mm*	200	1	.002	21	.09	.02	1.84
	(two vers.)	200	1	.0005	21	.09	.01	.73
	M-109 155mm*	252	1	.002	18	n.a.	.02	n.a.
	(two vers.)	252	1	.0005	18	n.a.	.01	n.a.
b. non-US								
1. SLBM's								
a) Britain	Polaris A-3	64	6	.2	4600	.51	2.05	7.99
b) France	MSBS M-20	80	1	1	3000	.51	1.00	3.89
2. Intermediate (MR/IRBM's)								
a) France	SSBS S-3	18	1	1	3500	.40	1.00	6.25
3. Tactical								
a) Greece, Turkey	Honest John	54	1	.02	40	1.02	.07	.07
b) West Germany	Pershing 1A	72	1	.4	720	.22	.54	11.33
c) France	Pluton	42	1	.025	120	.16	.09	3.19
d) Belgium, FRG, Britain, Italy, Netherlands	Lance	56	1	.05	110	.21	.14	3.24
e) Multiple non-U.S. NATO mbrs.	M-110 203mm*	200	1	.002	21	.09	.02	1.84
	(two vers.)	200	1	.0005	21	.09	.01	.73
e) Multiple non-U.S. NATO mbrs.	M-109 155mm*	252	1	.002	18	n.a.	.02	n.a.
	(two vers.)	252	1	.0005	18	n.a.	.01	n.a.

* : +5,000 nuclear artillery shells deployed in Europe (Incl. France)

F. *Mirage* IVA (#'s = #'s of aircraft)

France

Same as previous examples

G. Total number of SS-2Ø's required:

1. Without French forces: 27

2. With French forces: 46

V. NATO SCENARIO "B" (December 1987 Force Levels)

A. GLCM (#'s rep. "flights"; 1 flight = 16 missiles)

UK(2)				Italy(1)	FRG	Neth.	Belg.
A		B					
6	4	6	4	7	6	3	3

[3 x 3 + 3 x 2] x 2 3 x 3 3 x 2 3 3

B. *Pershing II* (#'s = #'s of missiles)

FRG (three locations)

A	B	C
36	36	36

[3 x 6]

C. SSBS S-3 (#'s = #'s of missiles)

Same as previous examples

D. In Port SSBN's (#'s = #'s of SSBN's; missiles = # x 16)

Same as previous examples

E. F-111 (#'s = # of aircraft)

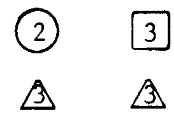
UK

Same as previous examples

C. SSBS S-3 (#'s = #'s of missiles)

Same as previous examples

D. In Port SSBN's (#'s = #'s of SSBN's; missiles = # x 16)



E. F-111 (#'s = # of aircraft)

UK

Same as previous examples

F. *Mirage* IVA (#'s = #'s of aircraft)

France

Same as previous examples

G. Total number of SS-20's required:

1. Without French forces: 19
2. With French forces: 34

E. F-111 (#'s = # of aircraft)

UK

$\boxed{12}$ x 2   16 x 6

3 x2   3 x 6

F. *Mirage* IVA (#'s = #'s of aircraft)

France

[$\boxed{3}$ + 7 + 7] x 2

[3 3 3] x 2

G. Total number of SS-20's required:

1. Without French forces: 14

2. With French forces: 33

IV. NATO SCENARIO "A" (December 1987 Force Levels)

A. GLCM (#'s rep. "flights"; 1 flight = 16 missiles)

UK(2) A	UK(2) B	Italy(1)	FRG	Neth.	Belg.
$\boxed{1}$ 5	$\boxed{1}$ 5	6 $\boxed{1}$	5 $\boxed{1}$	2 $\boxed{1}$	2 $\boxed{1}$
3 x 2	3 x 2	3 x 2	3 x 2	3	3

B. *Pershing II* (#'s = #'s of missiles)

FRG (three locations)

A	B	C
36	36	36

[3 x 6]

E. F-111 (#'s = #'s of a/c)

UK (two locations)

$\boxed{12}$ 48 $\boxed{12}$ 48

3 + 3

F. *Mirage* IVA (#'s = #'s of aircraft)

France (two locations)

[$\boxed{3}$ 14] x 2

3 x 2

G. Total number of SS-20's required:

1. Without French forces: 7

2. With French forces: 22

III. NATO SCENARIO "B"

A. GLCM (#'s = #'s of missiles)

UK **Italy**

16 16 16 16

3 3 3 3

B. *Pershing II* (#'s = #'s of missiles)

FRG (one location)

9 9 9 9

3 3

C. SSBS S-3 (#'s = #'s of missiles)

$\boxed{3}$ $\boxed{3}$ $\boxed{3}$ $\boxed{3}$ $\boxed{3}$ $\boxed{3}$

[3 x 12]

D. In Port SSBN's (#'s = #'s of SSBN's; missiles = # x 16)

1 $\boxed{1}$

3 3

M110 203mm:

CMP= 1.84/0.73 OAR= 0.723 (may be much lower)

SSKP:

$SSKP_1$= 0.97/0.75	$SSKP_4$= 0.348/0.156
$SSKP_2$= 0.97/0.75	$SSKP_5$= 0.231/0.099
$SSKP_3$= 0.50/0.214	$SSKP_6$= 0.18/0.076

TKP:

TKP_1= 0.701/.542	TKP_4= 0.252/.113
TKP_2= 0.701/.542	TKP_5= 0.167/.072
TKP_3= 0.362/.174	TKP_6= 0.13/.055

Sea based

SLCM (vs. air defense):

CMP= 1551.63 OAR= 0.615

SSKP:		TKP:	
$SSKP_1$= 1.0	$SSKP_4$= 1.0	TKP_1= 0.615	TKP_4= 0.615
$SSKP_2$= 1.0	$SSKP_5$= 1.0	TKP_2= 0.615	TKP_5= 0.615
$SSKP_3$= 1.0	$SSKP_6$= 1.0	TKP_3= 0.615	TKP_6= 0.615

SECTION 5

WTO NUCLEAR SYSTEM TKP's

Assumptions:

A. Hardness:

H_1= 5 psi	H_4= 1ØØ psi
H_2= 1Ø psi	H_5= 2ØØ psi
H_3= 5Ø psi	H_6= 3ØØ psi

B. OAR:

OAR_{single}:

P_c= Ø.9

P_l= Ø.9 (.85 for SS-N-6, SS-1/4/5, FROG and SS-C-1b, .8 for SSN5)

P_f= Ø.95 (.9 for SSN5, SS1/4/5/12, FROG, and SSC1b)

P_g= Ø.95 (except for those listed above where = Ø.9)

P_w= .99

P_a= Ø (except for SS-C-4, AS-15, SS-N-21 where P_a = Ø.15 and Ø.25 for AS-3, SS-C-1b and SS-N-12)

P_e= Ø

OAR_{mirv}:

same as above except that P_{mirv}= .9

THEATER-STRATEGIC

Sea based

SS-N-5

CMP= 0.42 OAR= 0.577

SSKP:		TKP:	
$SSKP_1$= 0.549	$SSKP_4$= 0.093	TKP_1= 0.317	TKP_4= 0.054
$SSKP_2$= 0.549	$SSKP_5$= 0.044	TKP_2= 0.317	TKP_5= 0.025
$SSKP_3$= 0.146	$SSKP_6$= 0.044	TKP_3= 0.084	TKP_6= 0.025

SS-N-6 (Mod 1):

CMP= 4.11 OAR= 0.684

SSKP:		TKP:	
$SSKP_1$= 1.0	$SSKP_4$= 0.615	TKP_1= 0.684	TKP_4= 0.422
$SSKP_2$= 0.988	$SSKP_5$= 0.444	TKP_2= 0.676	TKP_5= 0.304
$SSKP_3$= 0.788	$SSKP_6$= 0.357	TKP_3= 0.539	TKP_6= 0.244

SS-N-17 (limited deployment):

CMP= 1.69 OAR= 0.724

SSKP:		TKP:	
$SSKP_1$= 0.959	$SSKP_4$= 0.324	TKP_1= 0.694	TKP_4= 0.235
$SSKP_2$= 0.860	$SSKP_5$= 0.215	TKP_2= 0.623	TKP_5= 0.156
$SSKP_3$= 0.539	$SSKP_6$= 0.244	TKP_3= 0.341	TKP_6= 0.120

Land based

SS-4

CMP= .63 OAR= Ø.613

SSKP: TKP:

$SSKP_1$= Ø.995 $SSKP_4$= Ø.472 TKP_1= Ø.61Ø TKP_4= Ø.289

$SSKP_2$= Ø.995 $SSKP_5$= Ø.325 TKP_2= Ø.61Ø TKP_5= Ø.199

$SSKP_3$= Ø.645 $SSKP_6$= Ø.256 TKP_3= Ø.395 TKP_6= Ø.157

SS-5:

CMP= 2.75 OAR= Ø.613

SSKP: TKP:

$SSKP_1$= Ø.995 $SSKP_4$= Ø.472 TKP_1= Ø.61Ø TKP_4= Ø.289

$SSKP_2$= Ø.995 $SSKP_5$= Ø.325 TKP_2= Ø.61Ø TKP_5= Ø.199

$SSKP_3$= Ø.645 $SSKP_6$= Ø.256 TKP_3= Ø.395 TKP_6= Ø.157

SS-2Ø (3 MIRV):

CMP= 7Ø.Ø8 OAR_{mirv}= Ø.651

SSKP: TKP:

$SSKP_1$= 1.Ø $SSKP_4$= 1.Ø TKP_1= Ø.651 TKP_4= Ø.651

$SSKP_2$= 1.Ø $SSKP_5$= 1.Ø TKP_2= Ø.651 TKP_5= Ø.651

$SSKP_3$= 1.Ø $SSKP_6$= Ø.999 TKP_3= Ø.651 TKP_6= Ø.651

THEATER-TACTICAL

Sea based

SS-N-12:

CMP= 3.11 OAR= Ø.67Ø (P_a= Ø.25)

SSKP: TKP:

$SSKP_1$= Ø.997 $SSKP_4$= Ø.514 TKP_1= Ø.668 TKP_4= Ø.344

$SSKP_2$= Ø.997 $SSKP_5$= Ø.359 TKP_2= Ø.668 TKP_5= Ø.241

$SSKP_3$= Ø.69Ø $SSKP_6$= Ø.284 TKP_3= Ø.462 TKP_6= Ø.19Ø

SS-N-21:

CMP= 213.98 OAR= Ø.615 (P_a= Ø.15)

SSKP: TKP:

$SSKP_1$= 1.Ø $SSKP_4$= 1.Ø TKP_1= Ø.615 TKP_4= Ø.615

$SSKP_2$= 1.Ø $SSKP_5$= 1.Ø TKP_2= Ø.615 TKP_5= Ø.615

$SSKP_3$= 1.Ø $SSKP_6$= 1.Ø TKP_3= Ø.615 TKP_6= Ø.615

Land based

FROG-7:

CMP= 7.14 OAR= Ø.613

SSKP: TKP:

$SSKP_1$= 1.Ø $SSKP_4$= Ø.8Ø9 TKP_1= Ø.613 TKP_4= Ø.613

$SSKP_2$= 1.Ø $SSKP_5$= Ø.64Ø TKP_2= Ø.613 TKP_5= Ø.392

$SSKP_3$= Ø.932 $SSKP_6$= Ø.536 TKP_3= Ø.571 TKP_6= Ø.329

SS-12:

CMP= 1.41 OAR= 0.650

SSKP: TKP:

$SSKP_1 = 0.931$ $SSKP_4 = 0.279$ $TKP_1 = 0.605$ $TKP_4 = 0.181$

$SSKP_2 = 0.931$ $SSKP_5 = 0.182$ $TKP_2 = 0.605$ $TKP_5 = 0.118$

$SSKP_3 = 0.412$ $SSKP_6 = 0.141$ $TKP_3 = 0.268$ $TKP_6 = 0.092$

SS-21:

CMP= 12.73 OAR= 0.724

SSKP: TKP:

$SSKP_1 = 1.0$ $SSKP_4 = 0.948$ $TKP_1 = 0.724$ $TKP_4 = 0.686$

$SSKP_2 = 1.0$ $SSKP_5 = 0.838$ $TKP_2 = 0.724$ $TKP_5 = 0.599$

$SSKP_3 = 0.992$ $SSKP_6 = 0.746$ $TKP_3 = 0.718$ $TKP_6 = 0.540$

SS-22:

CMP= 23.43 OAR= 0.724

SSKP: TKP:

$SSKP_1 = 1.0$ $SSKP_4 = 0.996$ $TKP_1 = 0.724$ $TKP_4 = 0.720$

$SSKP_2 = 1.0$ $SSKP_5 = 0.965$ $TKP_2 = 0.724$ $TKP_5 = 0.617$

$SSKP_3 = 1.0$ $SSKP_6 = 0.920$ $TKP_3 = 0.720$ $TKP_6 = 0.552$

SS-23

CMP= 13.37 OAR= 0.724

SSKP: TKP:

$SSKP_1 = 1.0$ $SSKP_4 = 0.995$ $TKP_1 = 0.724$ $TKP_4 = 0.720$

$SSKP_2 = 1.0$ $SSKP_5 = 0.852$ $TKP_2 = 0.724$ $TKP_5 = 0.617$

$SSKP_3 = 0.994$ $SSKP_6 = 0.763$ $TKP_3 = 0.720$ $TKP_6 = 0.552$

SS-C-1b:

CMP= 3.11 OAR= Ø.46Ø (P_a= Ø.25)

SSKP: TKP:

$SSKP_1$= Ø.997 $SSKP_4$= Ø.514 TKP_1= Ø.459 TKP_4= Ø.236

$SSKP_2$= Ø.997 $SSKP_5$= Ø.359 TKP_2= Ø.459 TKP_5= Ø.165

$SSKP_3$= Ø.69Ø $SSKP_6$= Ø.284 TKP_3= Ø.317 TKP_6= Ø.131

SS-C-4:

CMP= 213.98 OAR= Ø.615 (P_a= Ø.15)

SSKP: TKP:

$SSKP_1$= 1.Ø $SSKP_4$= 1.Ø TKP_1= Ø.615 TKP_4= Ø.615

$SSKP_2$= 1.Ø $SSKP_5$= 1.Ø TKP_2= Ø.615 TKP_5= Ø.615

$SSKP_3$= 1.Ø $SSKP_6$= 1.Ø TKP_3= Ø.615 TKP_6= Ø.615

SS-1c *Scud* B/C:

CMP=Ø.15 OAR= Ø.613

SSKP: TKP:

$SSKP_1$= Ø.248 $SSKP_4$= Ø.Ø34 TKP_1= Ø.152 TKP_4= Ø.Ø21

$SSKP_2$= Ø.248 $SSKP_5$= Ø.Ø21 TKP_2= Ø.152 TKP_5= Ø.Ø13

$SSKP_3$= Ø.Ø55 $SSKP_6$= Ø.Ø16 TKP_3= Ø.Ø34 TKP_6= Ø.Ø1Ø

FROG-3/-5:

CMP= 7.91 OAR= Ø.613

SSKP: TKP:

$SSKP_1$= 1.Ø $SSKP_4$= Ø.841 TKP_1= Ø.613 TKP_4= Ø.516

$SSKP_2$= 1.Ø $SSKP_5$= Ø.677 TKP_2= Ø.613 TKP_5= Ø.415

$SSKP_3$= Ø.949 $SSKP_6$= Ø.573 TKP_3= Ø.582 TKP_6= Ø.351

Air launched

AS-3 *Kangaroo*:

CMP= 1.0 OAR= 0.543 (P_a= 0.25)

SSKP:		TKP:	
$SSKP_1$= 0.85	$SSKP_4$= 0.207	TKP_1= 0.462	TKP_4= 0.112
$SSKP_2$= 0.85	$SSKP_5$= 0.133	TKP_2= 0.462	TKP_5= 0.072
$SSKP_3$= 0.314	$SSKP_6$= 0.102	TKP_3= 0.171	TKP_6= 0.055

AS-15:

CMP= 213.98 OAR= 0.615 (P_a= 0.15)

SSKP:		TKP:
$SSKP_1$= 1.0	$SSKP_4$= 1.0	
$SSKP_2$= 1.0	$SSKP_5$= 1.0	
$SSKP_3$= 1.0	$SSKP_6$= 1.0	

Artillery

S-23 180mm:

CMP= 0.15 OAR= 0.723

SSKP:		TKP:	
$SSKP_1$= 0.248	$SSKP_4$= 0.034	TKP_1= 0.179	TKP_4= 0.025
$SSKP_2$= 0.248	$SSKP_5$= 0.021	TKP_2= 0.179	TKP_5= 0.015
$SSKP_3$= 0.055	$SSKP_6$= 0.016	TKP_3= 0.040	TKP_6= 0.012

SECTION 6

FORCE STRUCTURE DISPOSITION

N_x = Number of missiles (aircraft)

Sum N_x = Total number of warheads on missiles (aircraft)

Sum W_x = Total yield of missiles (aircraft) in MT

Sum CMP_x = Total CMP of force

$\langle N_x \rangle$ = Average number of warheads per missile (aircraft)

Sum EMT_x = Total EMT

$\langle EMT_x \rangle$ = Average EMT per missile (aircraft)
[Sum W_x/N_x]

$\langle W_x \rangle$ = Average yield per warhead
[Sum W_x/Sum N_x]

$\langle CMP_x \rangle$ = Average CMP per warhead
[Sum CMP_x/Sum N_x]

A. Missiles: Land-based, theater-strategic

	US/NATO	(+Fr.)	Soviet/WTO
N_1	100	(118)	639
Sum N_1	100	(118)	1,439
Sum W_1	5	(23)	419
Sum CMP_1	53,122.00	(53,234.50)	28,172.50
$\langle N_1 \rangle$	1	(1)	2.23
Sum EMT_1	14	(32)	563
$\langle EMT_1 \rangle$	0.14	(0.27)	0.88
$\langle W_1 \rangle$	0.05	(0.19)	0.30
$\langle CMP_1 \rangle$	531.22	(451.1)	19.58

B. Missiles: Sea based, theater-strategic

	US/NATO	(+Fr.)	Soviet/WTO
N_2	80	(160)	444
Sum N_2	544	(624)	444
Sum W_2	84.8	(164.8)	444
Sum CMP_2	870.88	(1,182.08)	1,618.68
$\langle N_2 \rangle$	6.8	(3.9)	1
Sum EMT_2	152.96	(232.96)	442
$\langle EMT_2 \rangle$	1.91	(1.46)	1.0
$\langle W_2 \rangle$	0.16	(0.26)	1.0
$\langle CMP_2 \rangle$	1.6	(1.89)	3.65

C. Aircraft: Land based/long range, theater-strategic

	US/NATO	(+Fr.)	Soviet/WTO
N_3	120	('54)	310
Sum N_3	240	(274)	520
Sum W_3	240	(242.04)	520
Sum CMP_3	24,000	(24,521.9)	168,100
$\langle N_3 \rangle$	2	(1.78)	1.68
Sum EMT_3	240	(245.1)	520
$\langle EMT_3 \rangle$	2.0	(1.6)	1.68
$\langle W_3 \rangle$	1.0	(0.88)	1.0
$\langle CMP_3 \rangle$	100	(89.5)	323.08

D. THEATER-STRATEGIC TOTALS

	US/NATO	(+Fr.)	Soviet/WTO
N_{ts}	300	(432)	1,393
Sum N_{ts}	884	(1,016)	2,403
Sum W_{ts}	329.8	(430)	1,383
Sum CMP_{ts}	77,992	(78,942)	197,891
$\langle N_{ts} \rangle$	2.95	(2.35)	1.73
Sum EMT_{ts}	407	(510.8)	1,527
$\langle EMT_{ts} \rangle$	1.33	(1.18)	1.10
$\langle W_{ts} \rangle$	0.37	(0.42)	0.58
$\langle CMP_{ts} \rangle$	88.23	(77.70)	82.35

E. Missiles: Land based, theater-tactical

	US/NATO	(+Fr.)	Soviet/WTO
N_4	361	(403)	1,267
Sum N_4	361	(403)	1,267
Sum W_4	85.8	(86.13)	366.4
Sum CMP_4	70,511	(70,645)	8,473.99
$\langle N_4 \rangle$	1	(1)	1
Sum EMT_4	126.6	(130.38)	534.78
$\langle EMT_4 \rangle$	0.35	(0.32)	0.42
$\langle W_4 \rangle$	0.24	(0.21)	0.29
$\langle CMP_4 \rangle$	195.32	(175.3)	6.69

F. Aircraft: Medium range, land/CV based:

	US/NATO	(+Fr.)	Soviet/WTO
N_5	678	(778)	2,305
Sum N_5	1,122	(1,288)	3,310
Sum W_5	1,122	(1,125.03)	3,310
Sum CMP_5	244,800	(246,125)	3,310
$\langle N_5 \rangle$	1.65	(1.66)	811,000
Sum EMT_5	1,122	(1,135)	3,310
$\langle EMT_5 \rangle$	1.65	(1.46)	1.44
$\langle W_5 \rangle$	1.0	(0.87)	1.0
$\langle CMP_5 \rangle$	218.2	(191.1)	245.0

G. **THEATER-TACTICAL TOTALS:**

	US/NATO	(+Fr.)	Soviet/WTO
N_{tt}	1,039	(1,181)	3,572
Sum N_{tt}	1,483	(1,691)	4,577
Sum W_{tt}	1,207.8	(1,211.2)	3,676.4
Sum CMP_{tt}	315,311	(316,770)	819,474
$\langle N_{tt} \rangle$	1.43	(1.43)	1.28
Sum EMT_{tt}	1,248.6	(1,265.82)	3,845
$\langle EMT_{tt} \rangle$	1.2	(1.07)	1.08
$\langle W_{tt} \rangle$	0.81	(0.72)	0.8
$\langle CMP_{tt} \rangle$	212.62	(187.33)	179.04

THEATER-STRATEGIC FORCES
(projection to December 1987)

A. Missiles: Land-based, theater-strategic

	US/NATO (+Fr.)		Soviet/WTO
N_1	572	(590)	673
Sum N_1	572	(590)	1,573
Sum W_1	28.6	(46.6)	425.5
Sum CMP_1	303,858	(303,970.5)	28,172.5
$\langle N_1 \rangle$	1	(1)	2.23
Sum EMT_1	81	(99)	605.5
$\langle EMT_1 \rangle$	0.14	(0.17)	0.9
$\langle W_1 \rangle$	0.05	(0.08)	0.27
$\langle CMP_1 \rangle$	531.22	(515.2)	20.14

B. Missiles: Sea based, theater-strategic

	US/NATO (+Fr.)		Soviet/WTO
N_2	80	(160)	444
Sum N_2	544	(624)	444
Sum W_2	84.8	(164.8)	444
Sum CMP_2	870.88	(1,182.08)	1,618.68
$\langle N_2 \rangle$	6.8	(3.9)	1
Sum EMT_2	152.96	(232.96)	442
$\langle EMT_2 \rangle$	1.91	(1.46)	1.0
$\langle W_2 \rangle$	0.16	(0.26)	1.0
$\langle CMP_2 \rangle$	1.6	(1.89)	3.65

C. Aircraft: Land based/long range, theater-strategic

	US/NATO	(+Fr.)	Soviet/WTO
N_3	120	(154)	310
Sum N_3	240	(274)	520
Sum W_3	240	(242.04)	520
Sum CMP_3	24,000	(24,521.9)	168,100
$\langle N_3 \rangle$	2	(1.78)	1.68
Sum EMT_3	240	(245.1)	520
$\langle EMT_3 \rangle$	2.0	(1.6)	1.68
$\langle W_3 \rangle$	1.0	(0.88)	1.0
$\langle CMP_3 \rangle$	100	(89.5)	323.08

D. **THEATER-STRATEGIC TOTALS**

	US/NATO	(+Fr.)	Soviet/WTO
N_{ts}	772	(904)	1,472
Sum N_{ts}	1,356	(1,547)	2,537
Sum W_{ts}	353.4	(453.1)	1,390
Sum CMP_{ts}	328,728	(329,677)	201,395
$\langle N_{ts} \rangle$	1.76	(1.71)	1.78
Sum EMT_{ts}	474	(577.8)	1,570
$\langle EMT_{ts} \rangle$	0.61	(1.34)	1.10
$\langle W_{ts} \rangle$	0.26	(0.29)	0.55
$\langle CMP_{ts} \rangle$	242.42	(213.11)	79.38

d. <u>SLBM Totals</u> [incl Fr.]

1.	Number surviving	59	[108]
2.	% of original force	74%	[68%]
3.	Number reaching targets in return exchange	38	[73]
4.	% of original force	48%	[46%]
5.	Surviving CMP	703	[894]
6.	Destroyed CMP	168	[289]

3. <u>Aircraft</u>

a. <u>F-111</u> (CMP= 200)

$P_{surv,h} = (1-TKP_{50}) = 0.35$

$N_{surv,h} = 2[(12)(0.35)] = 8$

$P_{surv,uh} = 0.35$

$N_{surv,uh} = 2[(48)(0.35)] = 34$

$N_{surv,T} = \mathbf{42}$

Surviving CMP **8,400**
Destroyed CMP **15,600**

b. <u>*Mirage* IVA</u> (CMP= 15.35)

$P_{surv,h} = 0.35$

$N_{surv,h} = 2$

$P_{surv,uh} = 0.35$

$N_{surv,uh} = 10$

$N_{surv,T} = \mathbf{12}$

Surviving CMP **184.2**
Destroyed CMP **337.7**

2. SLBM's

a. *Poseidon* (CMP= 7.99; OAR_{mirv}= 0.651)

P_{surv}= 1.0 (invulnerable)

N_{surv}= **16**

==> in return exchange, **10** missiles (65%) would successfully reach their targets

Surviving CMP	**359.52**
Destroyed CMP	**0**

b. *Polaris A-3* (CMP= 7.99; OAR_{mirv}= 0.651)

$P_{surv,depl.}$= 1.0

$N_{surv,depl.}$= 2[(16)(1.0)]= **32**

$P_{surv,port}$= $(1-TKP_{30})$= 0.35

$N_{surv,port}$= 2[(16)(0.35)]= 11

$N_{surv,T}$= **43**

==> in return exchange, **28** missiles (65%) would successfully reach their targets

Surviving CMP	**343.57**
Destroyed CMP	**167.79**

c. MSBS M-20 (CMP= 3.89; OAR= 0.723)

$P_{surv,depl.}$= 1.0

$N_{surv,depl.}$= 2[(16)(1.0)]= 32

$P_{surv,port}$= 0.35

$N_{surv,port}$= 3[(16)(0.35)]= 17

$N_{surv,T}$= **49**

==> in return exchange, **35** missiles (65%) would successfully reach their targets

Surviving CMP	**190.61**
Destroyed CMP	**120.59**

b. *Pershing* II (CMP= 531.22; OAR= 0.723)
(3 loc.)

$P_{surv} = (1-TKP_{10})^2 = 0.12$

$N_{surv} = 3[(36)(.12)] =$ **13** [13 of 108 (12%)]

==> in return exchange **9** missiles (72%) would successfully reach their targets

Surviving CMP **6,906**
Destroyed CMP **50,466**

c. SSBS S-3 (CMP= 6.25; OAR= 0.723)

$P_{surv,h} = (1-TKP_{200})^2 = 0.12$

$N_{surv,h} =$ **2** [2 of 18 surviving (12%)]

==> in return exchange **2** missiles would successfully reach their targets (72%)

Surviving CMP **12.5**
Destroyed CMP **100**

d. IRBM Totals:

1.	Number surviving [incl.Fr.]	91	[93]
2.	% of original force	16 %	[16%]
3.	Number reaching targets in return exchange	57	[59]
4.	% of original force	10%	[10%]
5.	Surviving CMP	48,341	[48,353]
6.	Destroyed CMP	255,516	[255,616]

III. NATO scenario "A" (Dec 87)

A. SS-20 data:

$N_A = 300$	$\langle EMT_A \rangle = 0.85$ MT
Sum $N_A = 1{,}350$	$\langle W_A \rangle = 0.15$ MT
Sum $W_A = 202.5$	$\langle CMP_A \rangle = 23.36$
Sum $CMP_A = 31{,}536$	$CMP = 70.08$
$\langle N_A \rangle = 3$	$OAR_{mirv} = 0.651$
Sum $EMT_A = 382.5$	
$SSKP_{10} = 1.0$	$TKP_{10} = 0.651$
$SSKP_{30} = 1.0$	$TKP_{30} = 0.651$
$SSKP_{50} = 1.0$	$TKP_{50} = 0.651$
$SSKP_{200} = 1.0$	$TKP_{200} = 0.651$

B. NATO losses:

1. <u>IRBM's/Cruise missiles</u>:

a. <u>GLCM</u> (6 loc.) (CMP= 531.22; OAR= 0.615)

$P_{surv1} = 0.12$

$P_{surv2} = 0.35$

$N_{surv1} = 23[(16)(0.12)] = 44$

$N_{surv2} = 6[(16)(0.35)] = 34$

$N_{surv,T} = 78$ (78 of 464 surviv., 34%)

=> for return exchange, **48** missiles (62%) would successfully reach their targets.

Surviving CMP **41,435**
Destroyed CMP **205,050**

c. Aircraft Totals

1.	Number surviving	42	[54]
2.	% of original force	35%	[35%]
3.	Surviving CMP	8,400	[8,584]
4.	Destroyed CMP	15,600	[15,938]

4. ATTACK ANALYSIS

a. Soviet Forces:

1. SS-20 only:

a)	used	14	[33]
b)	% of total (267)	5%	[12%]
c)	CMP expended	981	[2,312]
d)	MT expended	6.3	[14.9]
e)	EMT expended	12.0	[28.1]

2. Total theater-strategic forces:

a)	% used	2%	[3%]

b. NATO forces:

1.	Number surviving	147	[231]
2.	% of original force	49%	[53%]
3.	Number reaching targets in return exchn. (missiles only)	68	[119]
4.	% of original force (missiles only)	38%	[41%]
5.	Surviving CMP	27,785	[28,253]
6.	Destroyed CMP	50,209	[50,686]

d. <u>SLBM Totals</u> [incl Fr.]

1.	Number surviving	70	[140]
2.	% of original force	88%	[88%]
3.	Number reaching targets in return exchange	45	[95]
4.	% of original force	56%	[59%]
5.	Surviving CMP	792	[1,064]
6.	Destroyed CMP	80	[119]

3. <u>Aircraft</u>

a. <u>F-111</u> (CMP= 200)

$P_{surv,h}= (1-TKP_{50})= 0.35$

$N_{surv,h}= 2[(12)(0.35)]= 8$

$P_{surv,uh}= 0.35$

$N_{surv,uh}= 2[(48)(0.35)]= 34$

$N_{surv,T}= \mathbf{42}$

Surviving CMP **8,400**
Destroyed CMP **15,600**

b. <u>*Mirage* IVA</u> (CMP= 15.35)

$P_{surv,h}= 0.35$

$N_{surv,h}= 2$

$P_{surv,uh}= 0.35$

$N_{surv,uh}= 10$

$N_{surv,T}= \mathbf{12}$

Surviving CMP **184.2**
Destroyed CMP **337.7**

2. SLBM's

a. *Poseidon* (CMP= 7.99; OAR_{mirv}= 0.651)

P_{surv}= 1.0 (invulnerable)

N_{surv}= **16**

==> in return exchange, **10** missiles (65%) would successfully reach their targets

Surviving CMP	**359.52**
Destroyed CMP	**0**

b. *Polaris A-3* (CMP= 7.99; OAR_{mirv}= 0.651)

$P_{surv,depl.}$= 1.0

$N_{surv,depl.}$= 3[(16)(1.0)]= **48**

$P_{surv,port}$= $(1-TKP_{30})$= 0.35

$N_{surv,port}$= 2[(16)(0.35)]= 6

$N_{surv,T}$= **54**

==> in return exchange, **35** missiles (65%) would successfully reach their targets

Surviving CMP	**431.5**
Destroyed CMP	**79.9**

c. MSBS M-20 (CMP= 3.89; OAR= 0.723)

$P_{surv,depl.}$= 1.0

$N_{surv,depl.}$= 4[(16)(1.0)]= 64

$P_{surv,port}$= 0.35

$N_{surv,port}$= 1[(16)(0.35)]= 17

$N_{surv,T}$= **70**

==> in return exchange, **50** missiles (72%) would successfully reach their targets

Surviving CMP	**272.3**
Destroyed CMP	**38.9**

b. *Pershing II* (CMP= 531.22; OAR= Ø.723)

P_{surv}= $(1-TKP_{1\emptyset})$= Ø.35

N_{surv}= 2[(18)(Ø.35)]= 13 [13 of 36 (35%)]

$N_{surv,T}$= **13**

==> in return exchange **9** missiles (72%) would successfully reach their targets

Surviving CMP **6,9Ø6**
Destroyed CMP **12,218**

c. SSBS S-3 (CMP= 6.25; OAR= Ø.723)

$P_{surv,h}$= $(1-TKP_{2\emptyset\emptyset})^2$= Ø.12

$N_{surv,h}$= **2** [2 of 18 surviving (12%)]

==> in return exchange **2** missiles would successfully reach their targets (72%)

Surviving CMP **12.5**
Destroyed CMP **1ØØ**

d. IRBM Totals:

1.	Number surviving [incl.Fr.]	35	[37]
2.	% of original force	35 %	[31%]
3.	Number reaching targets in return exchange	23	[24]
4.	% of original force	23%	[2Ø%]
5.	Surviving CMP	18,593	[18,6Ø5]
6.	Destroyed CMP	34,529	[34,629]

II. NATO scenario "B" (Dec 84)

A. SS-20 data:

$N_B = 400$	$\langle EMT_B \rangle = 0.85$ MT
Sum $N_B = 1,200$	$\langle W_B \rangle = 0.15$ MT
Sum $W_B = 180$	$\langle CMP_B \rangle = 23.36$
Sum $CMP_B = 28,032$	$CMP = 70.08$
$\langle N_B \rangle = 3$	$OAR_{mirv} = 0.651$
Sum $EMT_B = 340$	
$SSKP_{10} = 1.0$	$TKP_{10} = 0.651$
$SSKP_{30} = 1.0$	$TKP_{30} = 0.651$
$SSKP_{50} = 1.0$	$TKP_{50} = 0.651$
$SSKP_{200} = 1.0$	$TKP_{200} = 0.651$

B. NATO losses:

1. <u>IRBM's/Cruise missiles</u>:

a. <u>GLCM</u> (2 loc.) (CMP= 531.22; OAR= 0.615)

$P_{surv,uh} = (1 - TKP_{10}) = 0.35$

$N_{surv,uh} = 4[(16)(0.35)] = 22$

$N_{surv,T} =$ **22** (22 of 64 surviv., 34%)

=> for return exchange, **14** missiles (62%) would successfully reach their targets.

Surviving CMP **11,687**
Destroyed CMP **22,311**

c. Aircraft Totals

1.	Number surviving	42	[54]
2.	% of original force	35%	[35%]
3.	Surviving CMP	8,400	[8,584]
4.	Destroyed CMP	15,600	[15,938]

4. ATTACK ANALYSIS

a. **Soviet Forces:**

1. SS-20 only:

a)	used	7	[22]
b)	% of total (267)	2.6%	[8.2%]
c)	CMP expended	491	[1,542]
d)	MT expended	3.15	[9.9]
e)	EMT expended	5.95	[18.7]

2. Total theater-strategic forces:

a)	% used	0.5%	[1.6%]

b. **NATO forces:**

1.	Number surviving	136	[199]
2.	% of original force	45%	[45%]
3.	Number reaching targets in return exchn. (missiles only)	60	[97]
4.	% of original force (missiles onlv)	33%	[34%]
5.	Surviving CMP	27,696	[28,083]
6.	Destroyed CMP	50,297	[50,856]

d. <u>SLBM Totals</u> [incl Fr.]

1.	Number surviving	59	[108]
2.	% of original force	74%	[68%]
3.	Number reaching targets in return exchange	38	[73]
4.	% of original force	48%	[46%]
5.	Surviving CMP	703	[894]
6.	Destroyed CMP	168	[289]

3. <u>Aircraft</u>

a. <u>F-111</u> (CMP= 200)

$P_{surv,h}$= $(1-TKP_{50})$= 0.35

$N_{surv,h}$= 2[(12)(0.35)]= 8

$P_{surv,uh}$= 0.35

$N_{surv,uh}$= 2[(48)(0.35)]= 34

$N_{surv,T}$= **42**

Surviving CMP **8,400**
Destroyed CMP **15,600**

b. <u>*Mirage* IVA</u> (CMP= 15.35)

$P_{surv,h}$= 0.35

$N_{surv,h}$= 2

$P_{surv,uh}$= 0.35

$N_{surv,uh}$= 10

$N_{surv,T}$= **12**

Surviving CMP **184.2**
Destroyed CMP **337.7**

2. SLBM's

a. *Poseidon* (CMP= 7.99; OAR_{mirv}= 0.651)

P_{surv}= 1.0 {invulnerable}

N_{surv}= **16**

==> in return exchange, **10** missiles (65%) would successfully reach their targets

Surviving CMP	**359.52**
Destroyed CMP	**0**

b. *Polaris A-3* (CMP= 7.99; OAR_{mirv}= 0.651)

$P_{surv,depl.}$= 1.0

$N_{surv,depl.}$= 2[(16)(1.0)]= **32**

$P_{surv,port}$= $(1-TKP_{30})$= 0.35

$N_{surv,port}$= 2[(16)(0.35)]= 11

$N_{surv,T}$= **43**

==> in return exchange, **28** missiles (65%) would successfully reach their targets

Surviving CMP	**343.57**
Destroyed CMP	**167.79**

c. MSBS M-20 (CMP= 3.89; OAR= 0.723)

$P_{surv,depl.}$= 1.0

$N_{surv,depl.}$= 2[(16)(1.0)]= 32

$P_{surv,port}$= 0.35

$N_{surv,port}$= 3[(16)(0.35)]= 17

$N_{surv,T}$= **49**

==> in return exchange, **35** missiles (65%) would successfully reach their targets

Surviving CMP	**190.61**
Destroyed CMP	**120.59**

b. *Pershing II* (CMP= 531.22; OAR= 0.723)

P_{surv}= $(1-TKP_{10})$= 0.35

N_{surv}= (36)(.35)= **13** [13 of 36 (35%)]

==> in return exchange **9** missiles (72%) would successfully reach their targets

Surviving CMP **6,906**
Destroyed CMP **12,218**

c. <u>SSBS S-3</u> (CMP= 6.25; OAR= 0.723)

$P_{surv,h}$= $(1-TKP_{200})^2$= 0.12

$N_{surv,h}$= **2** [2 of 18 surviving (12%)]

==> in return exchange **2** missiles would successfully reach their targets (72%)

Surviving CMP **12.5**
Destroyed CMP **100**

d. <u>IRBM Totals</u>:

1.	Number surviving [incl.Fr.]	35	[37]
2.	% of original force	35 %	[31%]
3.	Number reaching targets in return exchange	23	[24]
4.	% of original force	23%	[20%]
5.	Surviving CMP	18,593	[18,605]
6.	Destroyed CMP	34,529	[34,629]

Section 7
EXCHANGE AND FIRST STRIKE ANALYSES

I. NATO scenario "A" (Dec 84)

A. SS-2Ø data:

N_A= 267	$<EMT_A>$= Ø.85 MT
Sum N_A= 8Ø1	$<W_A>$= Ø.15 MT
Sum W_A= 12Ø.15	$<CMP_A>$= 23.36
Sum CMP_A= 18,711	CMP= 7Ø.Ø8
$<N_A>$= 3	OAR_{mirv}= Ø.651
Sum EMT_A= 227	
$SSKP_{1Ø}$= 1.Ø	$TKP_{1Ø}$= Ø.651
$SSKP_{3Ø}$= 1.Ø	$TKP_{3Ø}$= Ø.651
$SSKP_{5Ø}$= 1.Ø	$TKP_{5Ø}$= Ø.651
$SSKP_{2ØØ}$= 1.Ø	$TKP_{2ØØ}$= Ø.651

B. NATO losses:

1. IRBM's/Cruise missiles:

a. GLCM (2 loc.) (CMP= 531.22; OAR= Ø.615)

$P_{surv,h}$= $(1-TKP_{5Ø})$= Ø.35

$P_{surv,uh}$= $(1-TKP_{1Ø})$= Ø.35

$N_{surv,h}$= 2[(16)(Ø.35)]= 11

$N_{surv,uh}$= 2[(16)(Ø.35)]= 11

$N_{surv,T}$= 22 (22 of 64 surviv., 34%)

=> for return exchange, **14** missiles (62%) would successfully reach their targets.

Surviving CMP **11,687**
Destroyed CMP **22,311**

c. Aircraft Totals

1.	Number surviving	42	[54]
2.	% of original force	35%	[35%]
3.	Surviving CMP	8,400	[8,584]
4.	Destroyed CMP	15,600	[15,938]

4. ATTACK ANALYSIS

a. Soviet Forces:

1. SS-20 only:

a)	used	19	[34]
b)	% of total (300)	6%	[11%]
c)	CMP expended	1,332	[2,383]
d)	MT expended	8.55	[15.3]
e)	EMT expended	16.15	[28.9]

2. Total theater-strategic forces:

a)	% used	1.3%	[2.4%]

b. NATO forces:

1.	Number surviving	192	[255]
2.	% of original force	25%	[28%]
3.	Number reaching targets in return exchn. (missiles only)	95	[132]
4.	% of original force (missiles only)	12%	[15%]
5.	Surviving CMP	57,444	[57,831]
6.	Destroyed CMP	271,284	[271,843]

IV. NATO scenario "B" (Dec 87)

A. SS-2Ø data:

N_B= 45Ø	$\langle EMT_B \rangle$= Ø.85 MT
Sum N_B= 1,35Ø	$\langle W_B \rangle$= Ø.15 MT
Sum W_B= 2Ø2.5	$\langle CMP_B \rangle$= 23.36
Sum CMP_B= 31,536	CMP= 7Ø.Ø8
$\langle N_B \rangle$= 3	OAR_{mirv}= Ø.651
Sum EMT_B= 382.5	
$SSKP_{1Ø}$= 1.Ø	$TKP_{1Ø}$= Ø.651
$SSKP_{3Ø}$= 1.Ø	$TKP_{3Ø}$= Ø.651
$SSKP_{5Ø}$= 1.Ø	$TKP_{5Ø}$= Ø.651
$SSKP_{2ØØ}$= 1.Ø	$TKP_{2ØØ}$= Ø.651

B. NATO losses:

1. IRBM's/Cruise missiles:

a. GLCM (6 loc.) (CMP= 531.22; OAR= Ø.615)

P_{surv}= (1-$TKP_{1Ø}$)= Ø.35

N_{surv}= 29[(16)(Ø.35)]= 162

=> for return exchange, **1ØØ** missiles (62%) would successfully reach their targets.

Surviving CMP **86,Ø58**
Destroyed CMP **16Ø,428**

b. *Pershing II* (CMP= 531.22; OAR= 0.723)

$P_{surv} = (1-TKP_{10})^2 = 0.12$

$N_{surv} = 3[(36)(0.35)] = 13$ [13 of 108 (35%)]

$N_{surv,T} = $ **13**

==> in return exchange **9** missiles (72%) would successfully reach their targets

Surviving CMP **6,906**
Destroyed CMP **50,466**

c. SSBS S-3 (CMP= 6.25; OAR= 0.723)

$P_{surv,h} = (1-TKP_{200})^2 = 0.12$

$N_{surv,h} = $ **2** [2 of 18 surviving (12%)]

==> in return exchange **2** missiles would successfully reach their targets (72%)

Surviving CMP **12.5**
Destroyed CMP **100**

d. IRBM Totals:

1.	Number surviving [incl.Fr.]	175	[177]
2.	% of original force	33 %	[30%]
3.	Number reaching targets in return exchange	23	[24]
4.	% of original force	23%	[20%]
5.	Surviving CMP	92,964	[92,977]
6.	Destroyed CMP	210,894	[210,994]

2. SLBM's

a. *Poseidon* (CMP= 7.99; OAR_{mirv}= Ø.651)

P_{surv}= 1.Ø (invulnerable)

N_{surv}= **16**

==> in return exchange, **1Ø** missiles (65%) would successfully reach their targets

Surviving CMP	**359.52**
Destroyed CMP	**Ø**

b. *Polaris A-3* (CMP= 7.99; OAR_{mirv}= Ø.651)

$P_{surv,depl.}$= 1.Ø

$N_{surv,depl.}$= 3[(16)(1.Ø)]= **48**

$P_{surv,port}$= $(1-TKP_{3Ø})$= Ø.35

$N_{surv,port}$= 2[(16)(Ø.35)]= 6

$N_{surv,T}$= **54**

==> in return exchange, **35** missiles (65%) would successfully reach their targets

Surviving CMP	**431.5**
Destroyed CMP	**79.9**

c. MSBS M-2Ø (CMP= 3.89; OAR= Ø.723)

$P_{surv,depl.}$= 1.Ø

$N_{surv,depl.}$= 4[(16)(1.Ø)]= 64

$P_{surv,port}$= Ø.35

$N_{surv,port}$= 1[(16)(Ø.35)]= 17

$N_{surv,T}$= **7Ø**

==> in return exchange, **5Ø** missiles (72%) would successfully reach their targets

Surviving CMP	**272.3**
Destroyed CMP	**38.9**

d. <u>SLBM Totals</u> [incl Fr.]

1.	Number surviving	70	[140]
2.	% of original force	88%	[88%]
3.	Number reaching targets in return exchange	45	[95]
4.	% of original force	56%	[59%]
5.	Surviving CMP	792	[1,064]
6.	Destroyed CMP	80	[119]

3. <u>Aircraft</u>

a. <u>F-111</u> (CMP= 200)

$P_{surv,h} = (1-TKP_{50}) = 0.35$

$N_{surv,h} = 2[(12)(0.35)] = 8$

$P_{surv,uh} = 0.35$

$N_{surv,uh} = 2[(48)(0.35)] = 34$

$N_{surv,T} = 42$

Surviving CMP	8,400
Destroyed CMP	15,600

b. *Mirage* <u>IVA</u> (CMP= 15.35)

$P_{surv,h} = 0.35$

$N_{surv,h} = 2$

$P_{surv,uh} = 0.35$

$N_{surv,uh} = 10$

$N_{surv,T} = 12$

Surviving CMP	184.2
Destroyed CMP	337.7

c. Aircraft Totals

1.	Number surviving	42	[54]
2.	% of original force	35%	[35%]
3.	Surviving CMP	8,400	[8,584]
4.	Destroyed CMP	15,600	[15,938]

4. ATTACK ANALYSIS

a. **Soviet Forces:**

1. SS-20 only:

a)	used	27	[46]
b)	% of total (450)	6%	[10%]
c)	CMP expended	1,892	[3,224]
d)	MT expended	12.2	[20.7]
e)	EMT expended	23	[39]

2. Total theater-strategic forces:

a)	% used	2%	[3%]

b. **NATO forces:**

1.	Number surviving	287	[371]
2.	% of original force	37%	[41%]
3.	Number reaching targets in return exchn. (missiles only)	154	[206]
4.	% of original force (missiles only)	20%	[23%]
5.	Surviving CMP	102,156	[102,624]
6.	Destroyed CMP	226,574	[227,051]

SECTION 8
IMMEDIATE POPULATION LOSS

I. Model Development and Assumptions

A. Based on Hiroshima population loss model where:

1. R_{50} = radius from ground zero within which there were 50% casualties

2. casualties rapidly fell off outside of R_{50}

3. ~50% of casualties are from burns

4. average for protected and unprotected populace (combined), (W = 20 KT):

R_{50}(20 KT) = 0.8 mi

B. Assumptions:

1. 50% of population inside R_{50} are killed, none outside

2. scaling is intermediate between thermal effects ($R \Rightarrow W^{1/2}$) and blast and shock ($R \Rightarrow W^{1/3}$) such that $R \Rightarrow W^{0.4}$

therefore: $R_{50}(W)=[R_{50}(20\text{ KT})]\,[(W/20)^{0.4}]$ miles

C. Population Loss:

1. lethal area (A_1):

$A_1 = \pi\,[R_{50}(W)]^2$

$$A_1 = \pi\,[(R_{50}{}^2(20\text{ kt}))()W/20)^{0.8}]\ \text{mi}^2$$

2. population density = N_p per mi^2

a. see Sec. II for N_p for various regions

3. number killed = N_k:

$$N_k = 1/2\ N_p A_1 \text{ people}$$

4. total population loss due to strikes with *U* missiles with *M* MIRV's each:

$$N_{k,T} = 1/2\ N_p A_1 MU$$

5. for this case (SS-20 only):

M = 3 MIRV's

W = 150 KT

$$\therefore N_{k,T} = 15.12 N_p U \text{ people}$$

II. <u>Population density at target sites</u>

A. UK:

1. <u>GLCM</u>:

a. RAF Greenham Common: 40,000 (Newbury immediately nearby)

b. RAF Molesworth: $N_p = 200$ per km^2

2. <u>SLBM</u>:

a. $N_p = 200$ per km^2

3. <u>F-111</u>:

a. $N_p = 200$ per km^2

B. FRG

1. <u>GLCM</u>:

a. $N_p = 200$ per km^2

2. <u>*Pershing* II</u>:

a. Schwabisch Gmund: $N_p = 500$ per km^2

b. Neckarsulm: $N_p = 500$ per km^2

c. Neu Ulm: $N_p = 100$ per km^2

3. Belgium:

a. N_p = 200 per km^2

4. Netherlands:

a. N_p = 500 per km^2

5. Italy (Sicily):

a. N_p = 200 per km^2

6. France:

a. N_p = 100 per km^2

III. Population Loss Projections by Region and Scenario

A. UK

1. GLCM:

	Scen A	Scen B
a. Greenham Common		
Dec 84	40,000	40,000
Dec 86	40,000	80,000
b. Molesworth		
Dec 84	0	0
Dec 86	6,048	9,072
c. Subtotals		
Dec 84	40,000	40,000
Dec 86	46,048	89,072

2. SLBM:

Dec 84	3,024	3,024
Dec 86	3,024	3,024

3. F-111:

Dec 84	6,048	24,192
Dec 86	6,048	24,192

4. UK Totals:

	Scen A	Scen B
Dec 84	49,072	67,216
Dec 86	55,120	116,288

B. FRG:

1. GLCM:

Dec 84	0	0
Dec 86	6,048	6,048

2. *Pershing* II:

Dec 84	15,120	15,120
Dec 86	33,264	33,264

3. FRG Totals:

Dec 84	15,120	15,120
Dec 86	39,312	39,312

C. Belgium:

Dec 84	0	0
Dec 86	3,024	3,024

D. Netherlands:

Dec 84	0	0
Dec 86	7,560	7,560

E. Italy:

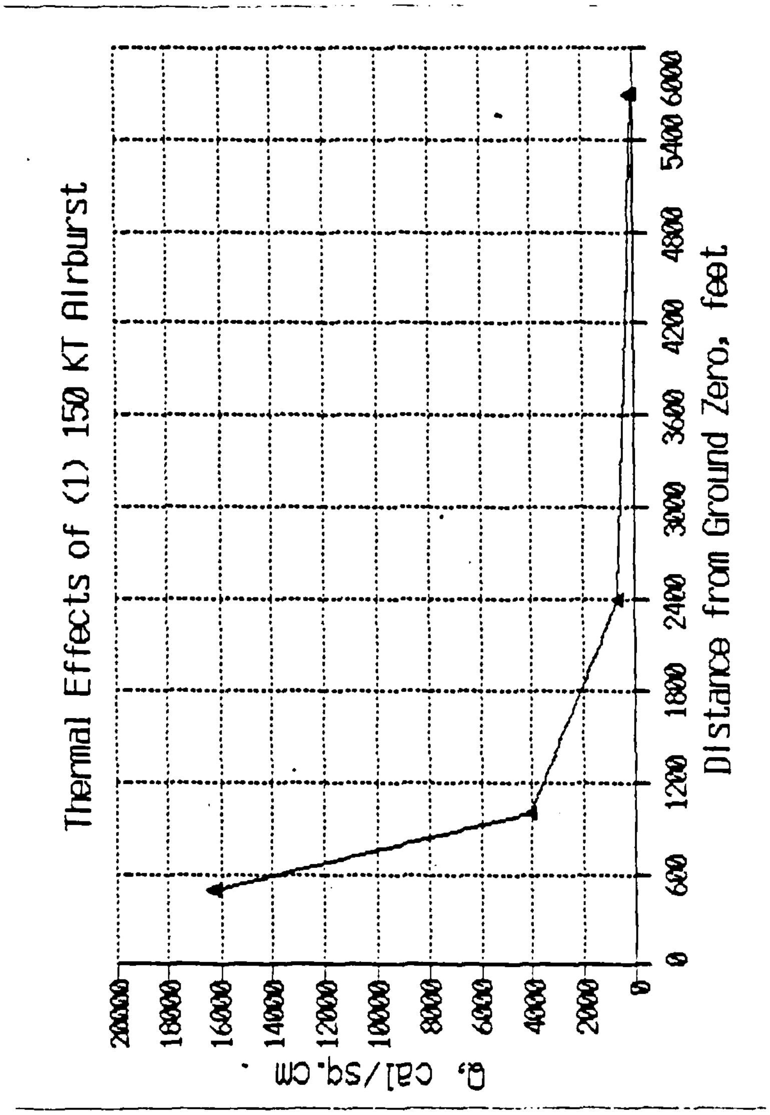
Dec 84	3,024	3,024
Dec 86	6,048	9,072

F. France:

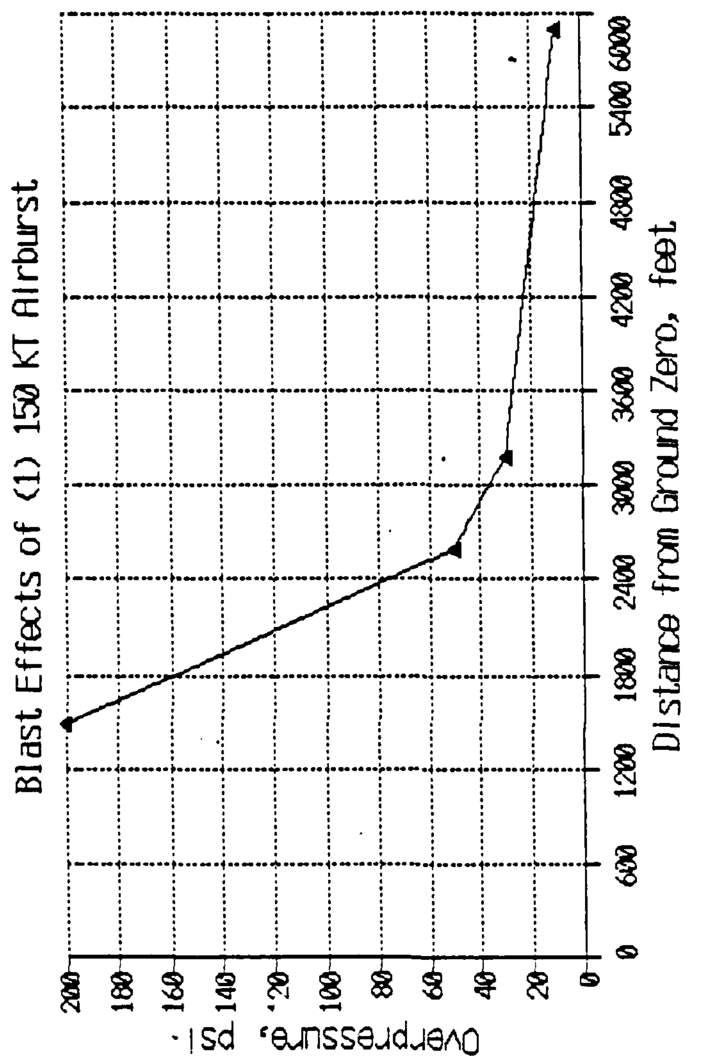
Dec 84	22,680	28,728
Dec 86	22,680	28,728

G. **European Population Loss Totals (+ France):**

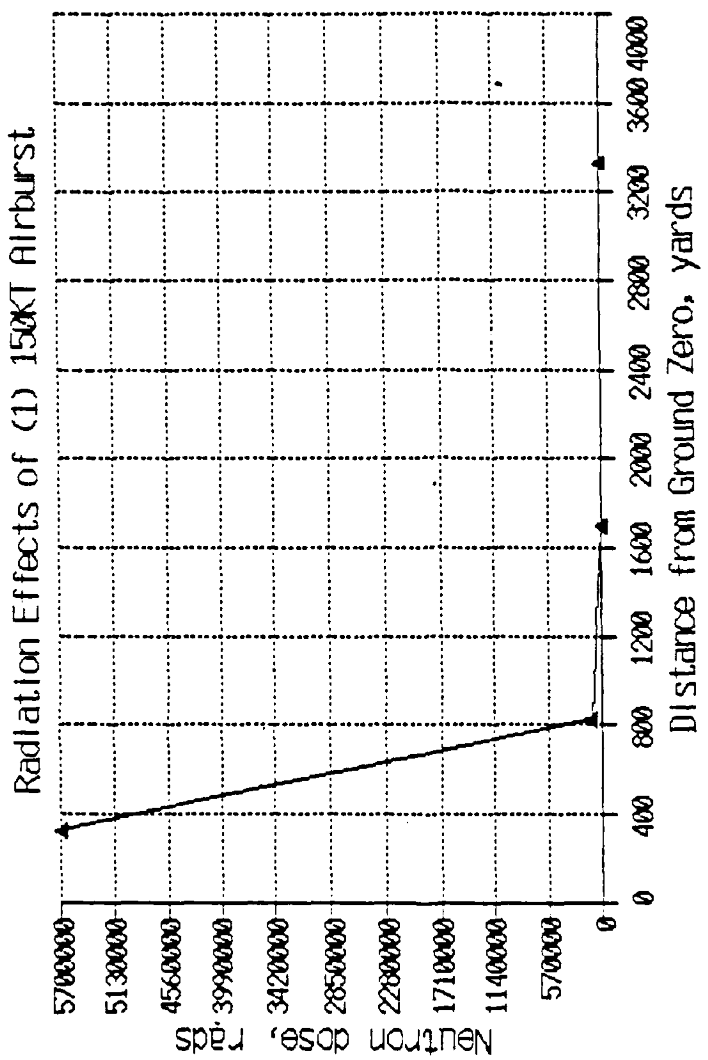
Dec 84	67,216 (89,896)	88,384 (117,112)
Dec 86	111,064 (133,744)	175,256 (203,984)



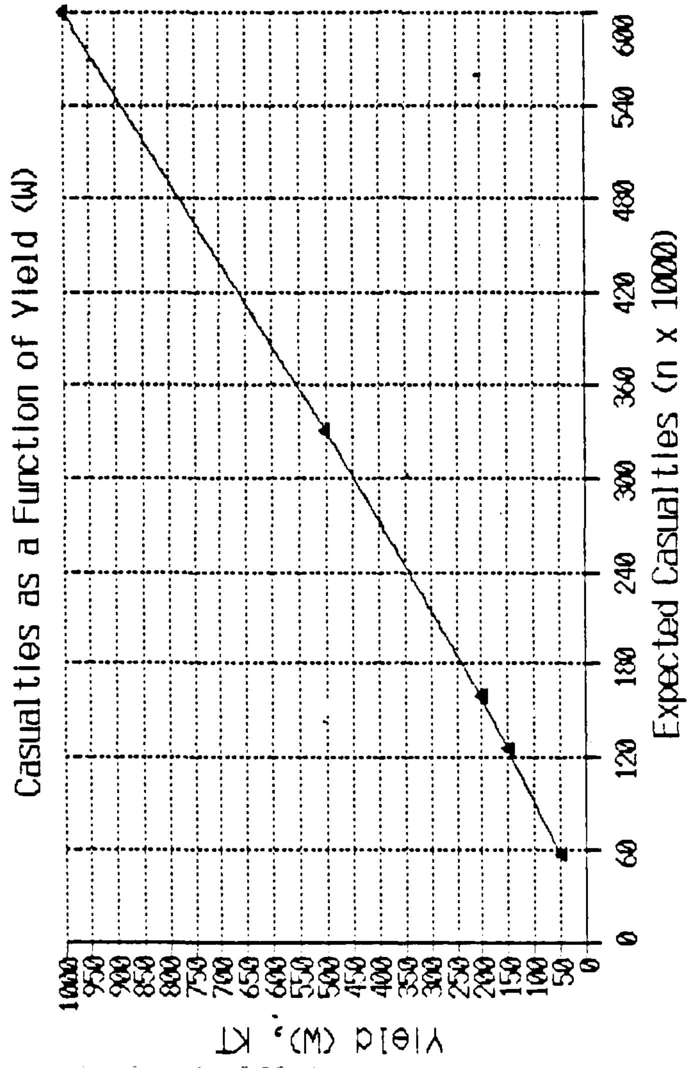
Thermal Effects of One (1) 150 KT Airburst
(Height = 1,000 ft.)



Blast Effects (Overpressure) from One (1) 150 KT Airburst.
(Height = 1,000 ft.)



Immediate Radiation Effects of One (1) 150 KT Airburst.
(Height = 1,000 ft.)



Casualties as a Function of Yield (W)
(Height = 1,000 ft.)

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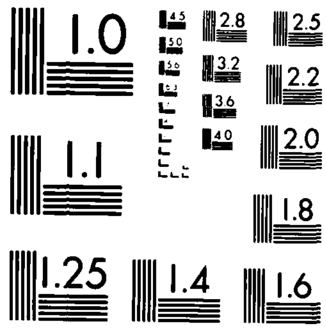
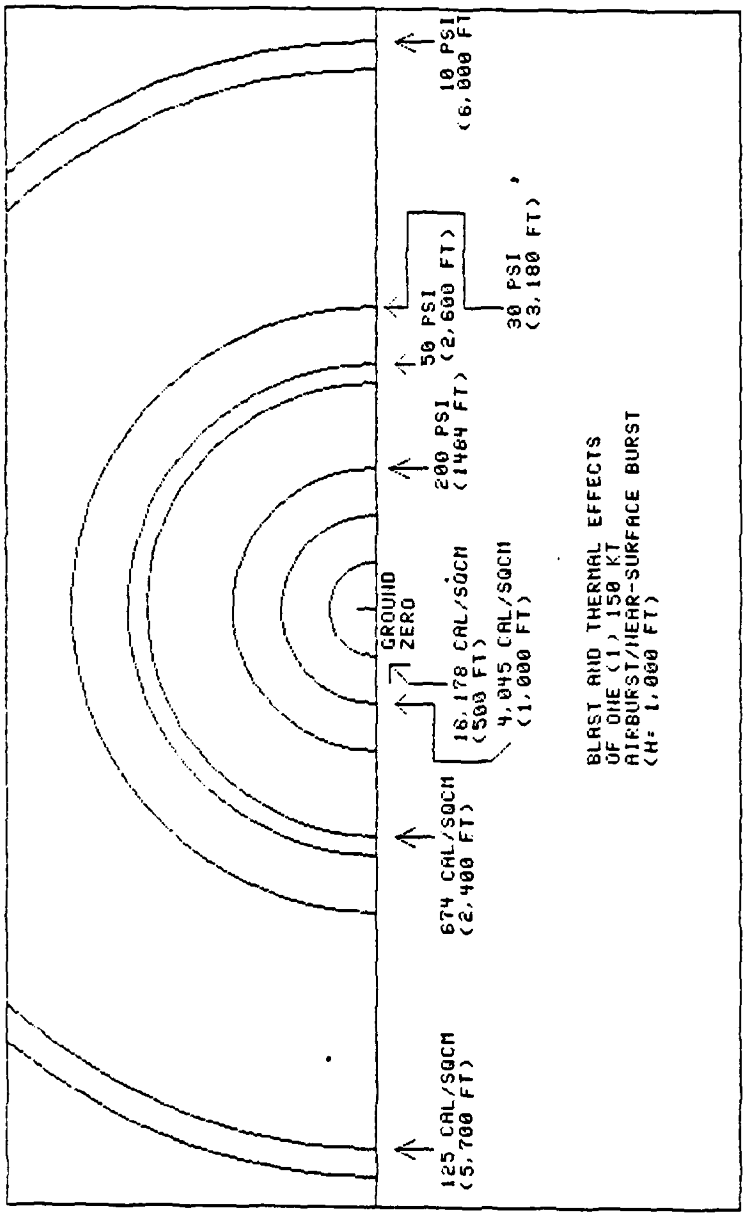


MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A



Plots of Blast and Thermal Effects of One (1) 15Ø KT Airburst.
(Height = 1,ØØØ ft.)

FALLOUT PATTERNS (Idealized)

I. Wind factors (prevailing winds)

	January	July
Southern UK	NE @ 20 mph	NNE @ 12 mph
Low Countries	ENE @ 15 mph	E @ 15 mph
Germany	ENE @ 12 mph	E @ 15 mph
France	ESE @ 12 mph	SE @ 10 mph
Italy (Sicily)	E -> ESE @ 20 mph	S -> SW @ 5 mph

II. Patterns:

A. Pattern used:

"Idealized fallout distribution pattern"

-- developed in Glasstone, S. and Dolan, P., *The Effects of Nuclear Weapons, Third Edition*, Sec. 9.82, p. 422.

B. Device:

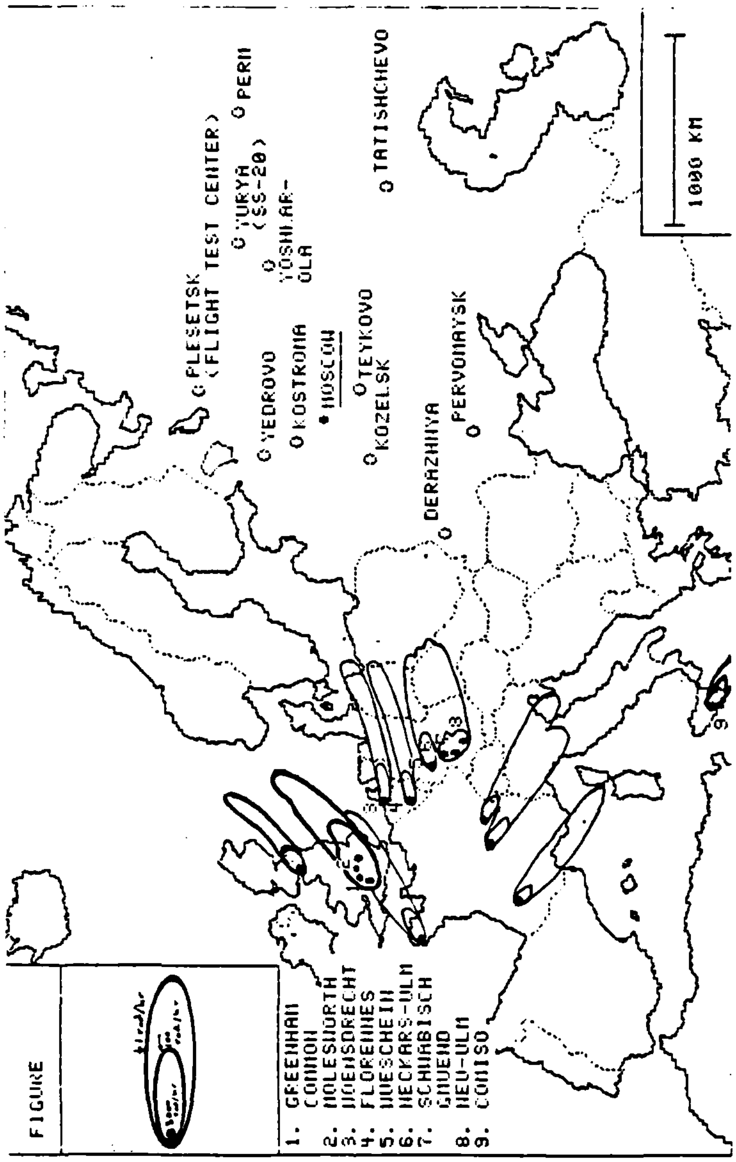
one (1) SS-20 RV: yield (W)= 150 KT with 50% fission yield

C. Values derived from Glasstone, Table 9.93, p. 430 and factored to incorporate prevailing winds listed above

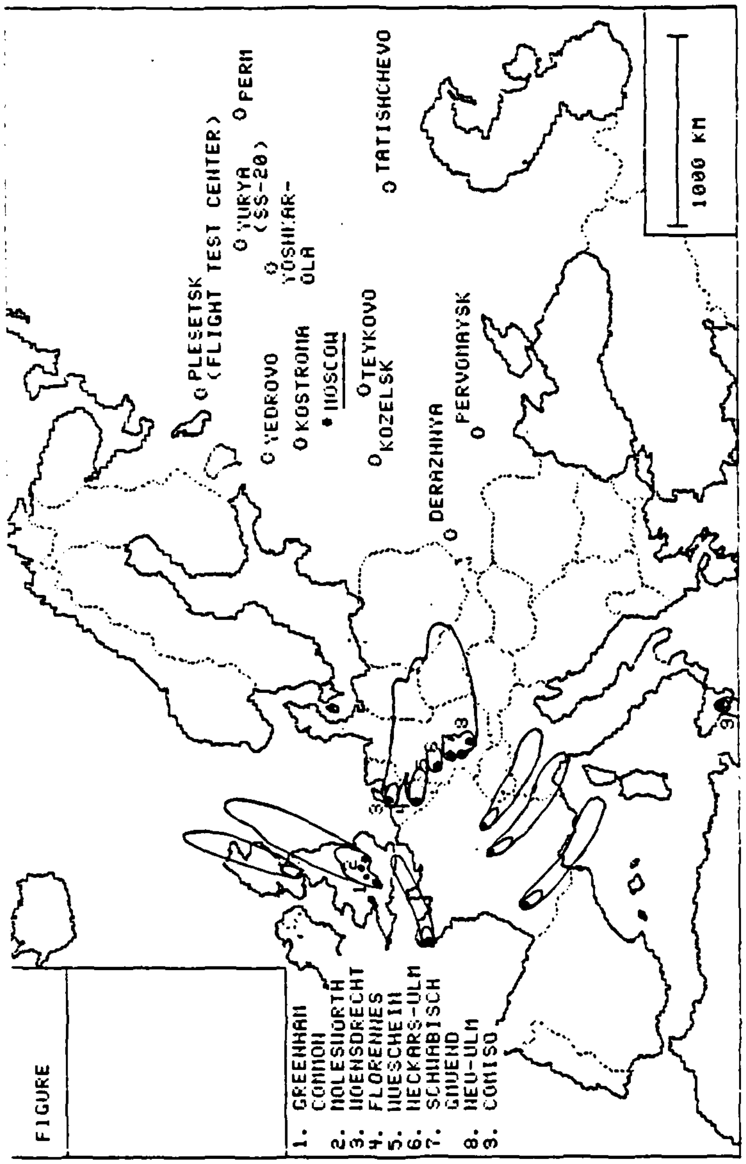
III. Fallout pattern parameters:

	Reference dose rate (rads/hr)	Down wind dist(s.m.)	Max. width (s.m.)	Ground Zero width(s.m.)
1. UK				
Jan	3000	9.78	0.61	0.51
(F=1.08)	100	91.63	8.30	3.45
	1	411.84	39.49	12.64
Jul	3000	8.15	0.51	0.43
(F=0.9)	100	76.36	6.91	3.2
	1	343.20	32.91	10.53

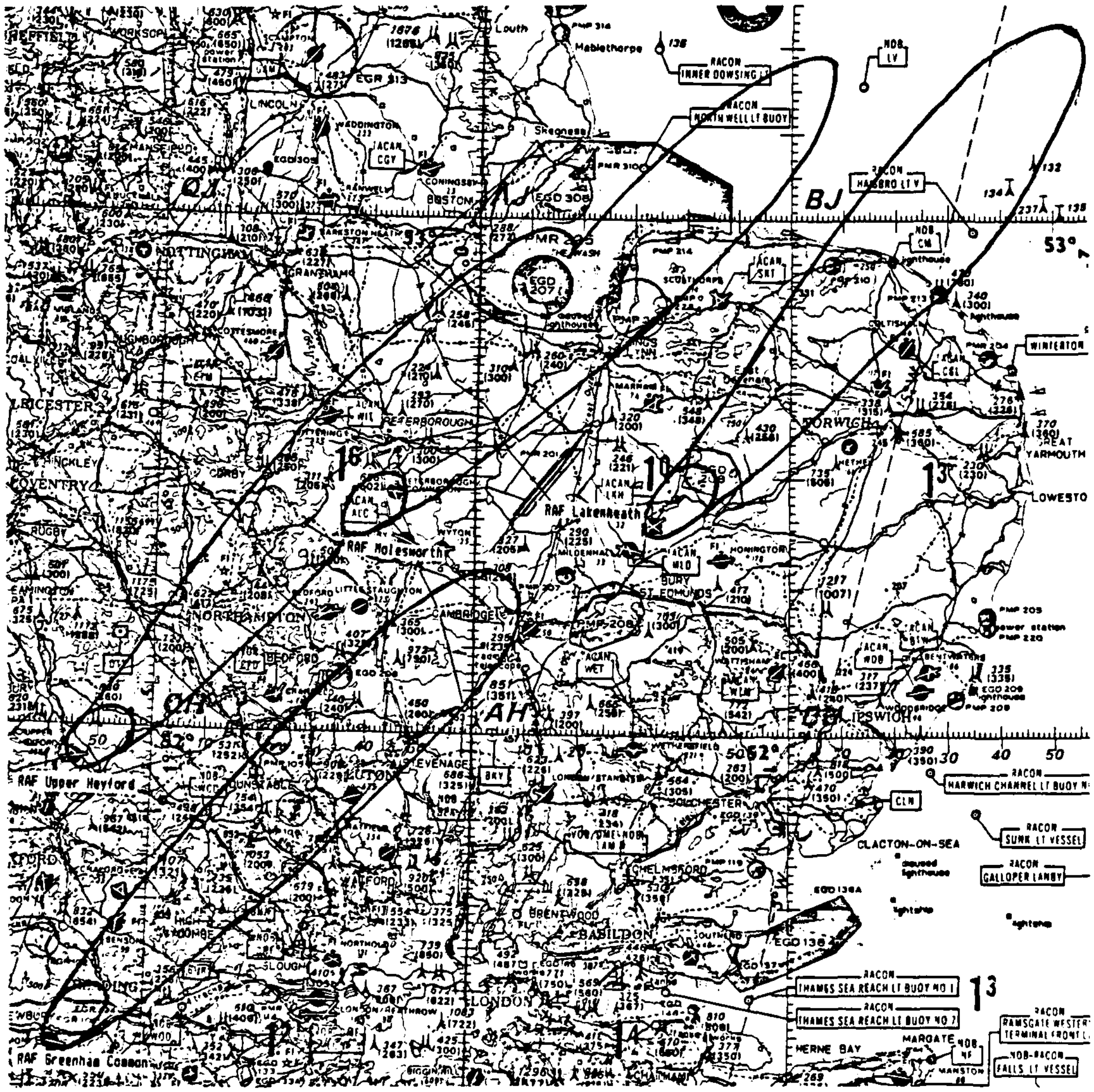
		Reference dose rate (rads/hr)	Down wind dist(s.m.)	Max. width (s.m.)	Ground Zero width(s.m.)
2.	Low Countries				
	Jan	3000	9.06	0.57	0.48
	(F=1.0)	100	84.85	7.68	3.2
		1	381.33	36.56	11.70
	Jul	3000	8.15	0.51	0.43
	(F=0.9)	100	76.36	6.91	3.20
		1	343.20	32.91	10.53
3.	Germany				
	Jan	3000	8.15	0.51	0.43
	(F=0.9)	100	76.36	6.91	3.20
		1	343.20	32.91	10.53
	Jul	3000	9.06	0.57	0.48
	(F=1.0)	100	84.85	7.68	3.20
		1	381.33	36.56	11.70
4.	France				
	Jan	3000	8.15	0.51	0.43
	(F=0.9)	100	76.36	6.91	3.20
		1	343.20	32.91	10.53
	Jul	3000	7.52	0.47	0.39
	(F=0.83)	100	70.42	6.38	2.66
		1	316.50	30.35	9.71
5.	Italy (Sicily)				
	Jan	3000	9.78	0.61	0.51
	(F=1.08)	100	91.63	8.30	3.45
		1	411.84	39.49	12.64
	Jul	3000	6.07	0.38	0.32
	(F=0.67)	100	56.85	5.15	2.14
		1	255.49	24.50	7.84



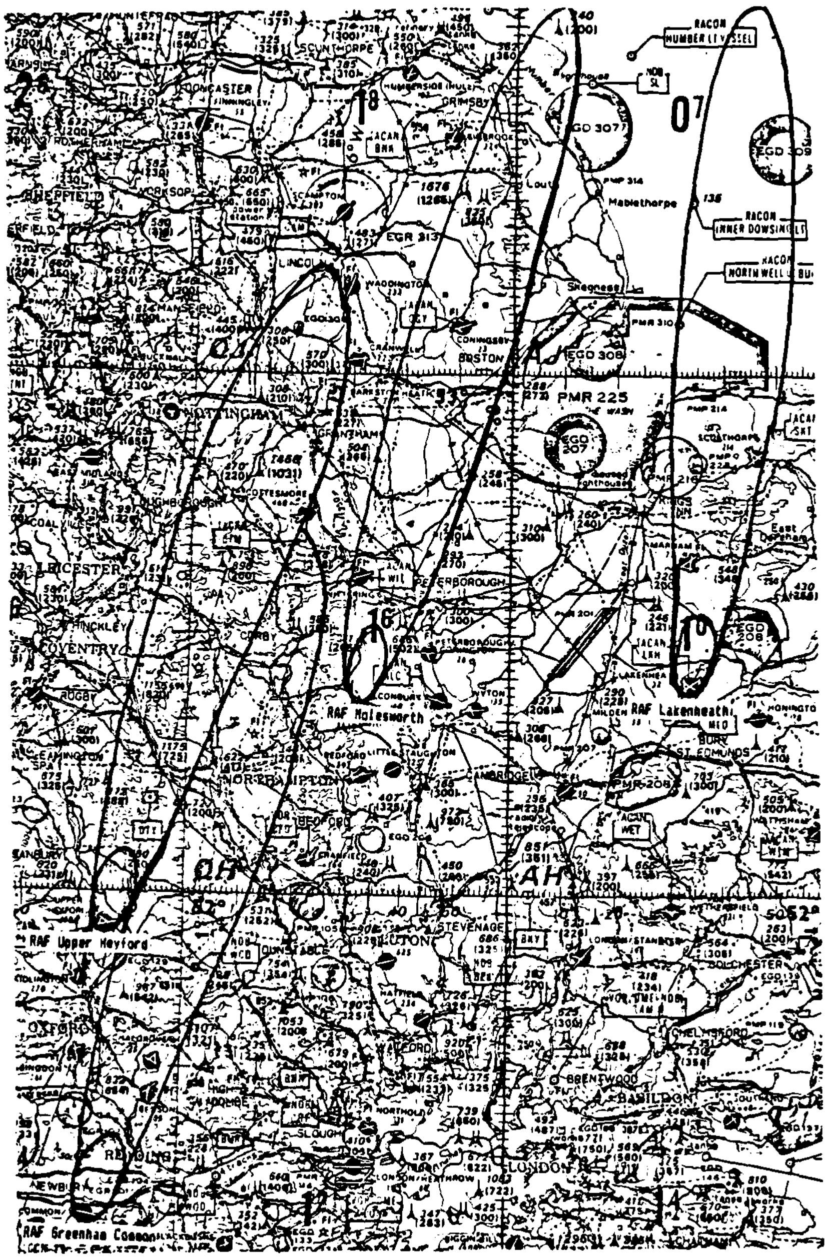
Fallout Patterns--January (mid-winter) Attack.



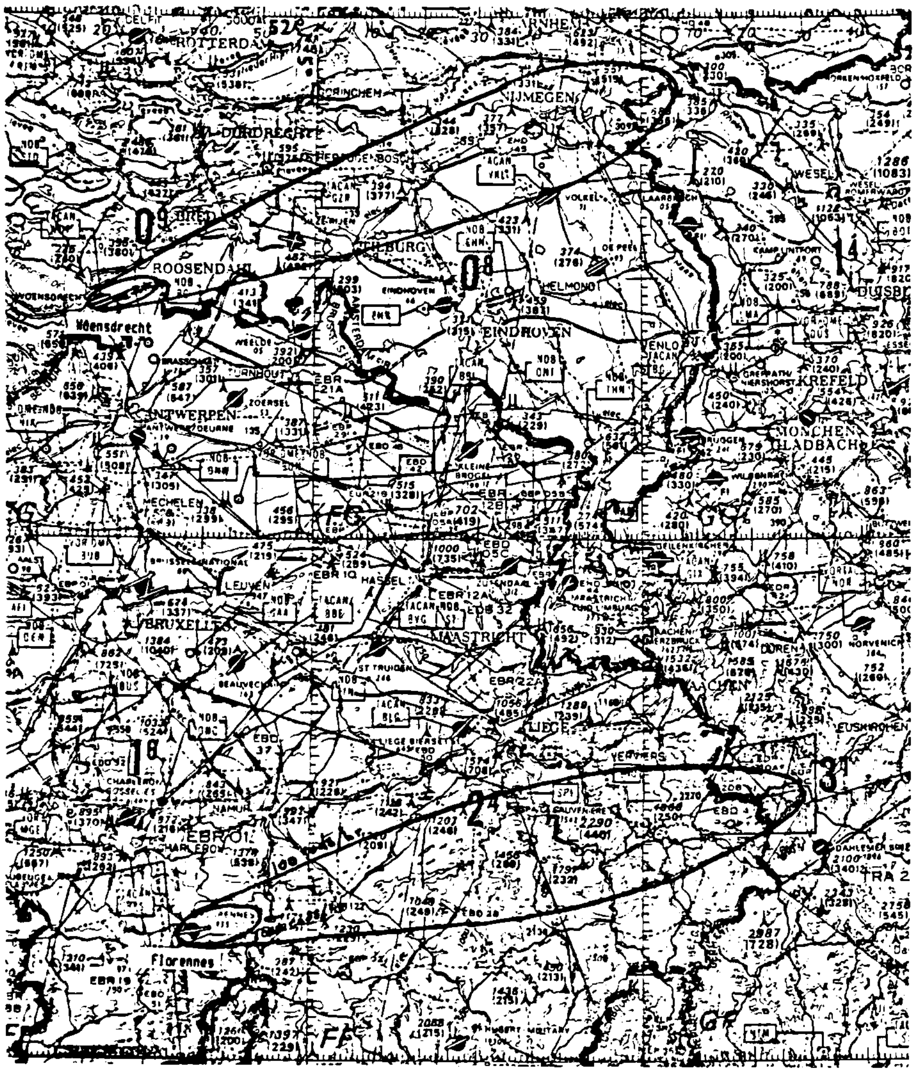
Fallout Patterns--July (mid-summer) Attack.



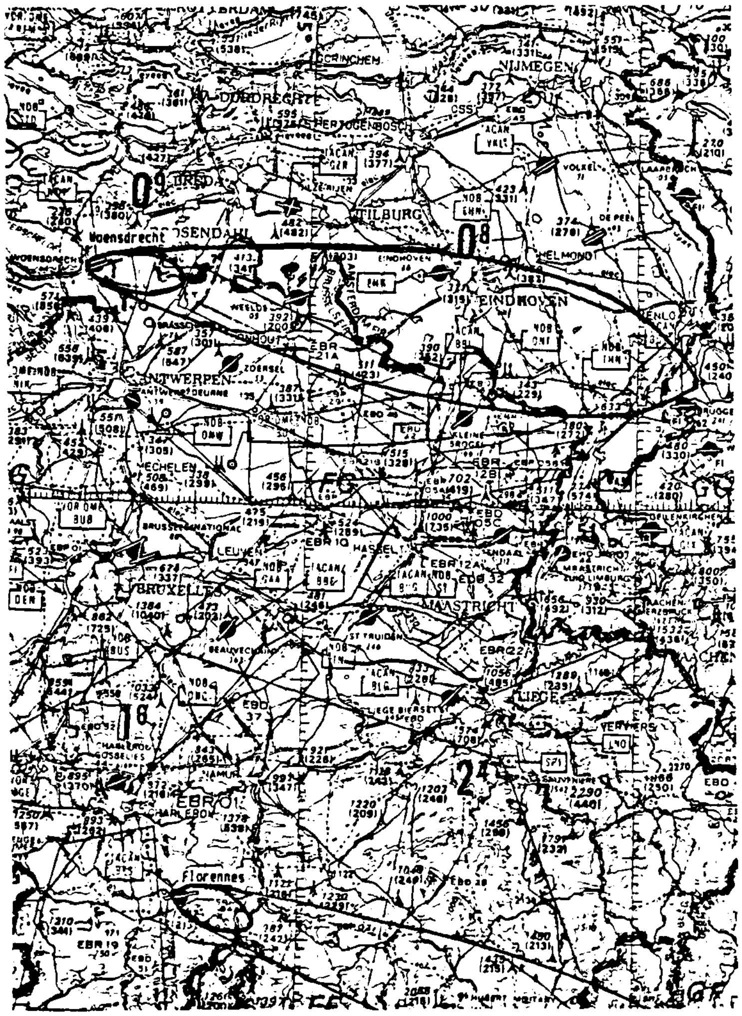
January Fallout Pattern for S.E. England.
(GLCM Bases and F-111 Bases shown)



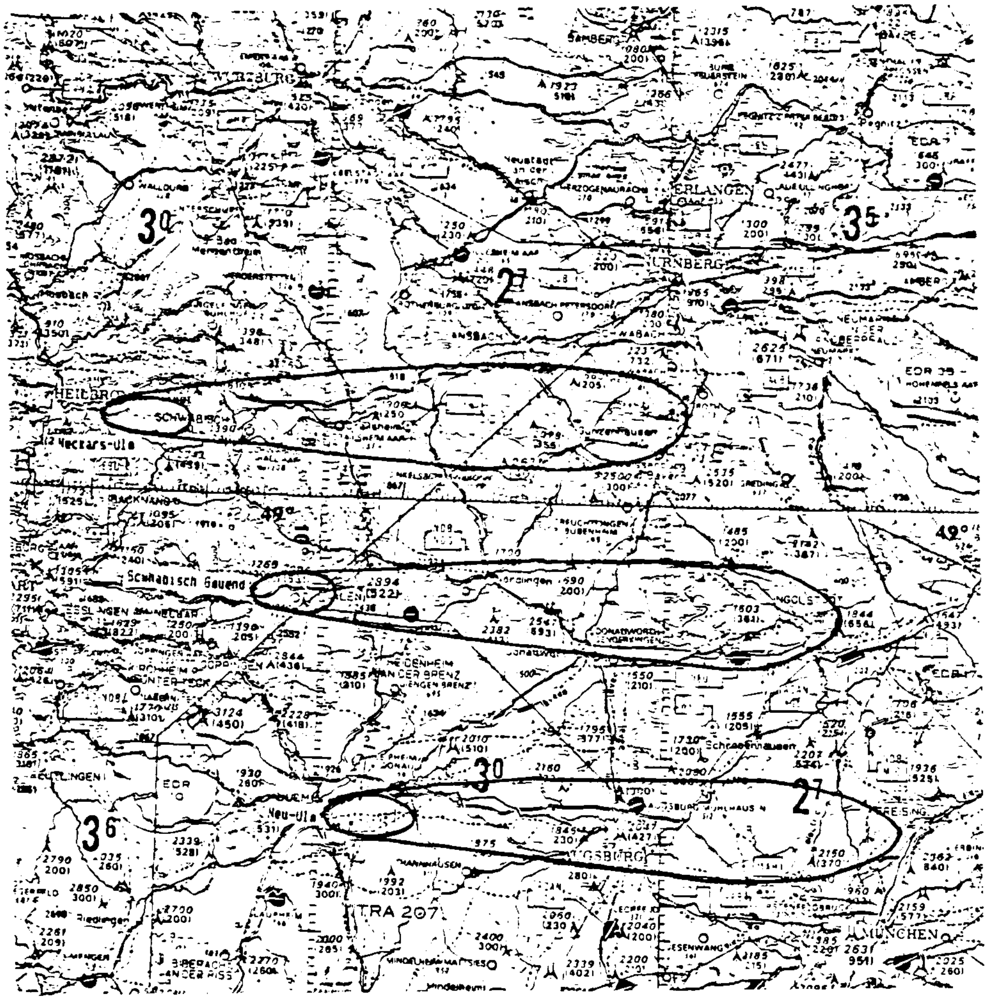
July Fallout Patterns for S.E. England.
(GLCM Bases and F-111 Bases shown)



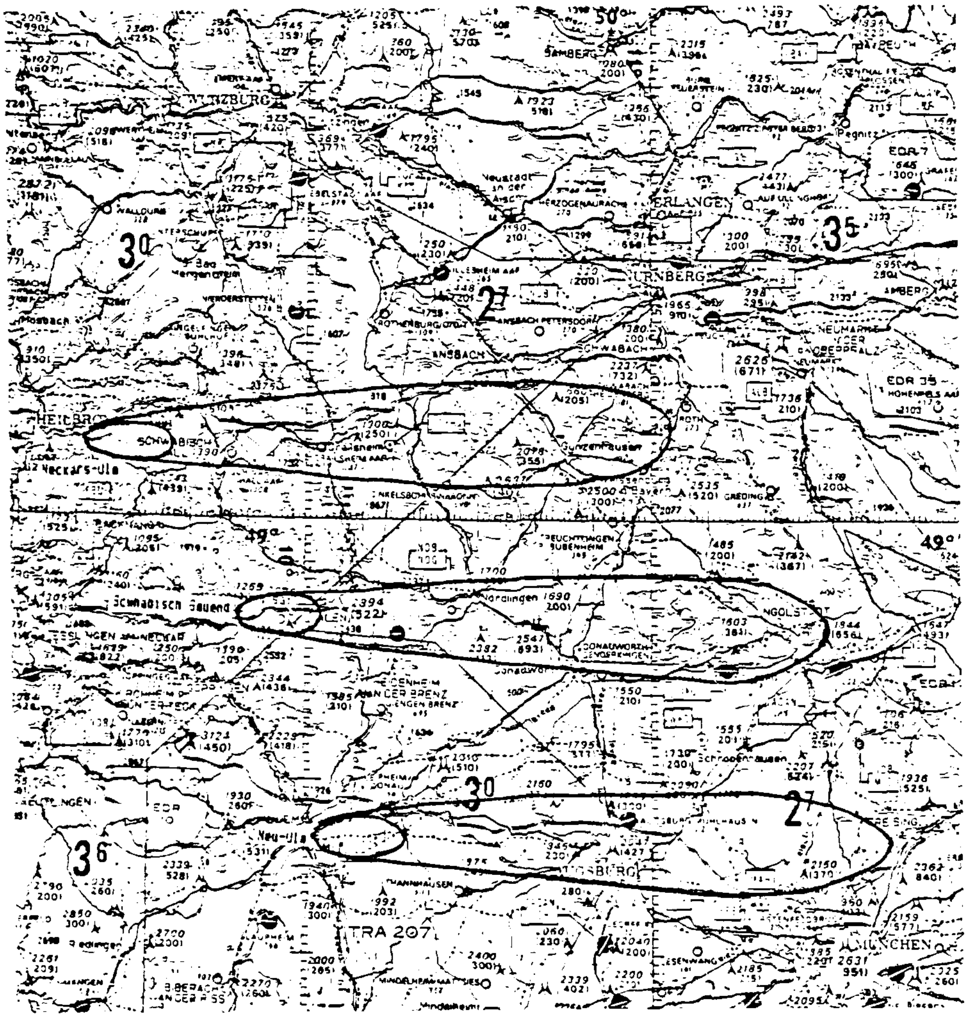
January Fallout Patterns for Netherlands and Belgium.
(GLCM Bases)



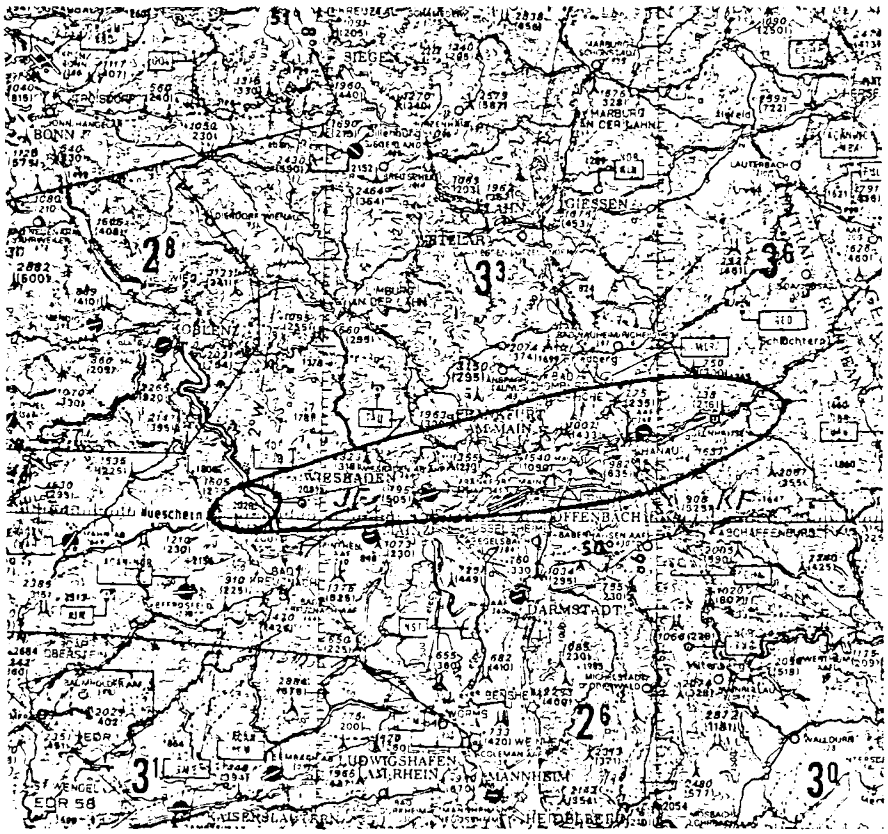
July Fallout Patterns for Netherlands and Belgium.
(GLCM Bases)



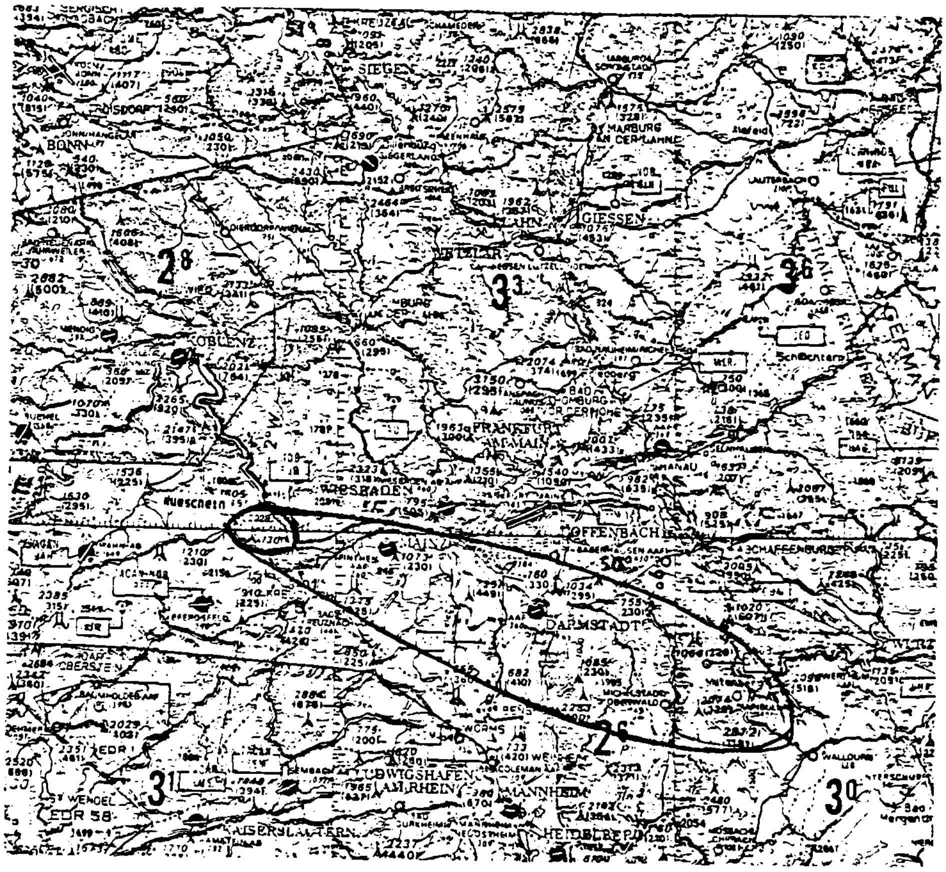
January Fallout Patterns for South Central West Germany.
(*Pershing* II Bases)



July Fallout Patterns for South Central West Germany.
(*Pershing* II Bases)



January Fallout Patterns for West Central West Germany.
(GLCM Base)



July Fallout Patterns for West Central West Germany.
(GLCM Bases)

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